MARCH 1960

Precision Metal Molding

INCLUDING DIE CASTINGS MAGAZINE

UNIVERSITY MICROFILMS
313 N FIRST ST
ANN ARBOR MICH

More aluminum in cars can mean greater safety on the highway

1960

1960 CORVAIR

1923 POMEROY

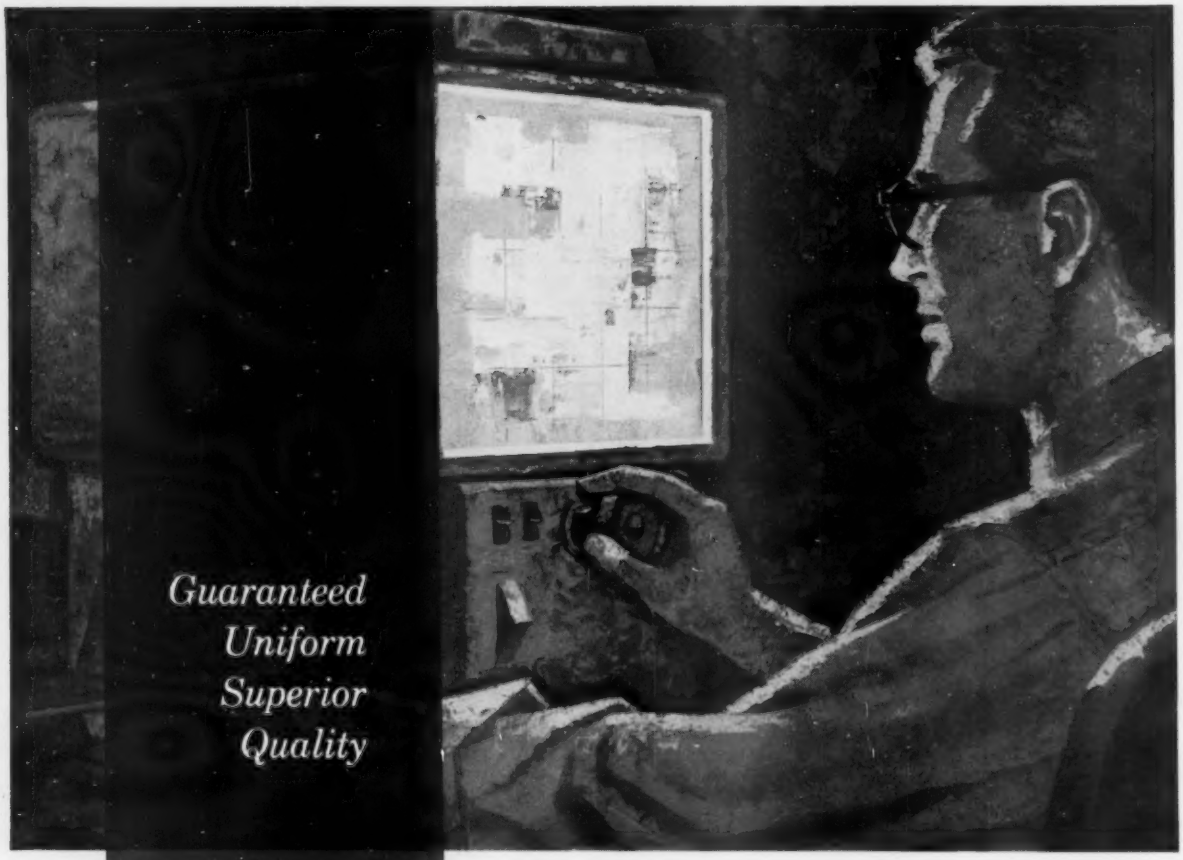
1923

AN INDUSTRIAL PUBLISHING CORPORATION MAGAZINE

PMM

The magazine for design, finishing and the use of:

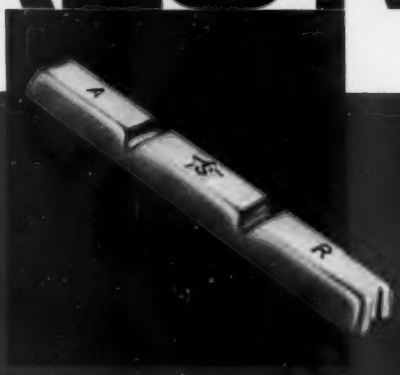
SINTERINGS • INVESTMENT CASTINGS • EXTRUSIONS
PLASTER MOLD CASTINGS • SHELL MOLD CASTINGS
PERMANENT MOLD CASTINGS • DIE CASTINGS



Guaranteed
Uniform
Superior
Quality

ALUMINUM

ALLOYS

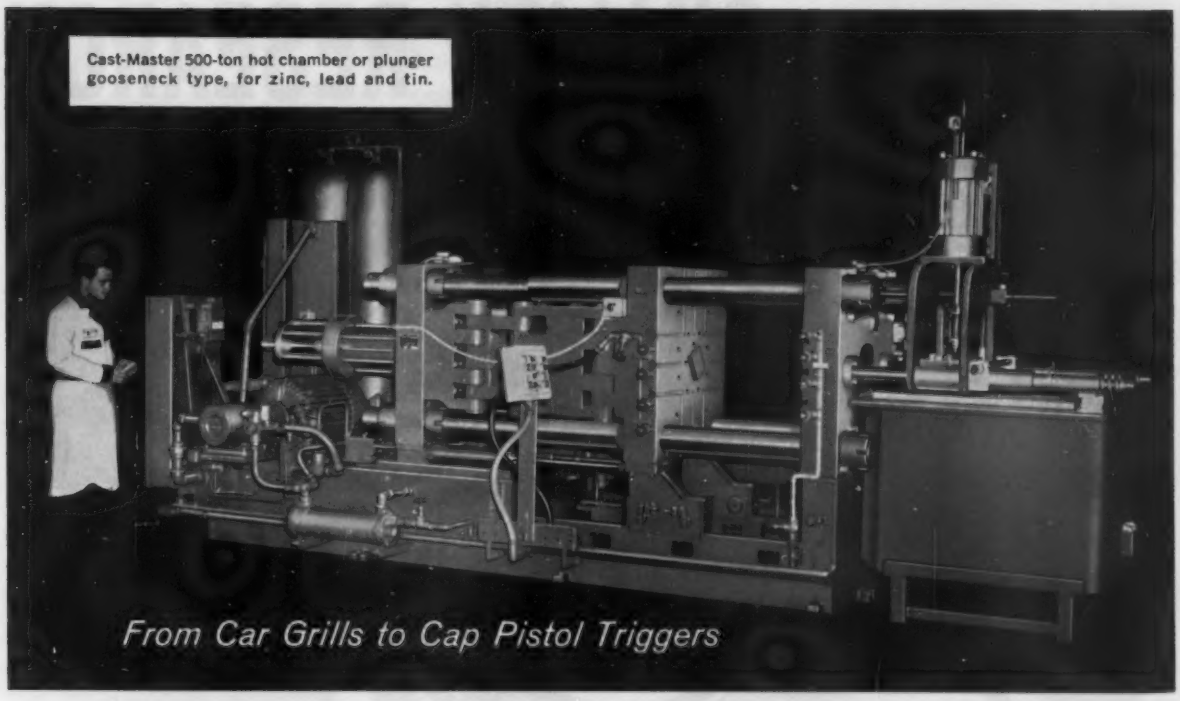


Careful inspection and testing of each melt is standard procedure at Aluminum Smelting & Refining Company, Inc. Each ingot is free of gas and impurities and meets your most exacting specifications to assure you of fast trouble-free production, sound castings and minimum scrap loss. Each melt is shipped with a certified analysis. You'll also like the fast, dependable delivery you receive. All shipments are palletized for handling ease.

Aluminum Smelting & Refining Co., Inc.

MAPLE HEIGHTS, OHIO — Telephone Tuxedo 7-3150
DETROIT, MICHIGAN — P. O. Box 4014 — Telephone Fitzhugh 7-3350
INDIANAPOLIS, INDIANA — 3737 N. Meridian — Walnut 4-9259

Circle No. 7 on Reader Service Card



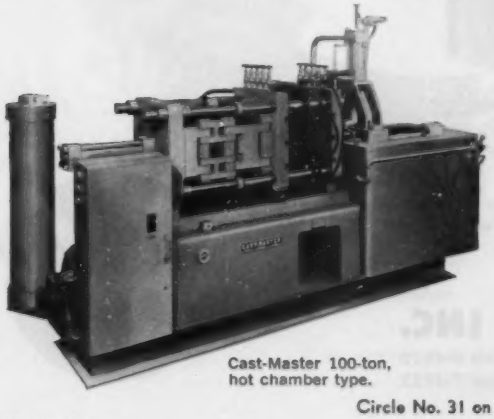
CAST-MASTERS MATCH DIE CASTING TRENDS

Wherever you see new products converting to die castings, you'll find a predominance of quality-production Cast-Master Die Casting Machines. The facts back the statement: Cast-Master has the line, the experience and the acceptance by die casters everywhere for tough new jobs.

The line has depth for a wide variety of needs. For example, Cast-Master's small automatic hot chamber machines are built for continuous, high speed production of hardware finish castings. They will cycle up to 1000 casting cycles per hour depending upon the die. They may be equipped for low pressure approach of the moveable die plate with fail-safe automatic controls, casting sweep arms, air jets for cleaning die surfaces and automatic die lubricating.

Cast-Master hot chamber machines, as illustrated by the 500-ton model above, are built for continuous, round-the-clock production of high quality castings. One large company operates 53 hot chamber Cast-Masters, from 500-ton to 1000-ton capacity. It placed its first order in 1946 and has ordered additional machines every year since that time. These semi-automatic machines are gaining new acceptance in every field.

We invite you to bring your die casting problems to us. Our engineers have experience not only in building die casting machines for a wide range of applications but also have practical die casting shop experience. Our laboratory for die try-out is available to you without obligation. Send for complete information.



Cast-Master 100-ton, hot chamber type.

H-P-M DIVISION-KOEHRING COMPANY

CAST-MASTER

23901 AURORA ROAD, BEDFORD, OHIO H27

Circle No. 31 on Reader Service Card

QUALITY RESEARCH

for your specific alloy

A&M's complete modern laboratory insures that every heat of every alloy meets your exact specifications. In addition our entire staff of metallurgical scientists is at your service in the solution of design, foundry and alloy selection problems. This insures you the very best in top-grade castings at a competitive price.

Remember, the best in finished product can only be made from the best quality alloy.

Producers of Quality Aluminum Alloy Since 1938

ALUMINUM and MAGNESIUM, INC.

1 HURON STREET • P.O. BOX 720 • SANDUSKY, OHIO • TELEPHONE: MAin 6-4610
P.O. BOX 156 • Corona, California • Telephone: REdwood 7-2922

Circle No. 6 on Reader Service Card

IN THIS ISSUE

March, 1960: Volume 18 Number 3

FEATURE ARTICLES

35 ALUMINUM IN THE AUTOMOBILE ENGINE: 1899 TO 1960

The use of aluminum in automobile engines is not new, but today's high speed, heavy cars demand even greater use of this light metal.

41 CASTING THE LIBERTY BELL

Investment casting isn't confined to industrial, jewelry, and dental trades. Short run, ornamental objects are best made by this method.

42 A MILLION POUNDS A MONTH

When you have a big material handling problem, look at fork trucks for a possible solution.

44 VACUUM MELTING FOR THE NEWER METALS AT JESSOP-SAVILLE

A short report on current English practice for melting tool and alloy steels as well as the exotic metals.

47 REDESIGN A LITTLE

Sinterings will often allow product simplification, lower manufacturing costs, and produce a better product.

48 EXTRUSION OF FERROUS METALS

There's a wide field of application for steel extrusions if the designer will start thinking in terms of them.

50 WHAT GOES INTO MAKING ALUMINUM EXTRUSIONS

A short picture tour through the plant of the William L. Bonnell Co., Inc. From ingot metal to anodized extrusion.

53 A 15-17% INCREASED USE OF ZINC

The market for zinc die castings is growing faster than normal industrial growth. Newer plating methods are part of the reason.

85 DESIGN FOR THE PMM PROCESSES

WHERE SANITATION'S A MUST
CUT COSTS 25 PERCENT
BETTER SIGHTING, LOWER COST
WANTED – CASE HARDENED, SMOOTH PARTS
TITANIUM CASTINGS IN PERMANENT MOLDS
FOR LOW INERTIA USE TRY MAGNESIUM

FINISHING SECTION

59 MACHINING THE CORVAIR CYLINDER HEAD

The die cast aluminum cylinder head on the Corvair is machined on the same equipment as cast iron heads, but at much higher rates.

61 USE BARREL FINISHING BEFORE PLATING

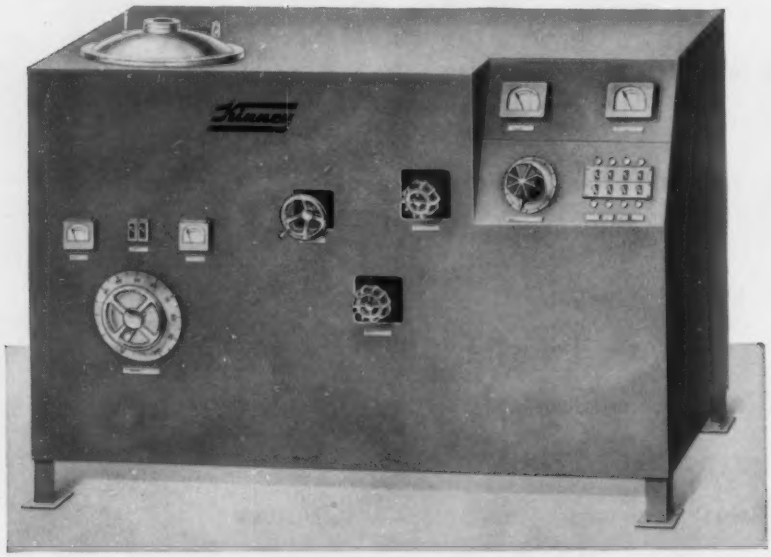
In many cases, barrel finishing before plating gives a surface which is good enough, it takes an expert to tell it's not hand buffed.

DEPARTMENTS

10 Useful Literature
12 Casting About
20 New Products
25 Industry News
28 Letters
84 Opportunities
89 Data in Ads

Copies of PRECISION METAL MOLDING are now available on microfilm from University Microfilms, 313 N. First St., Ann Arbor, Mich.

VACUUM SINTERING



TEMPERATURES TO 2200° C · · · PRESSURES TO .01 MICRON

Kinney®

SINTERING FURNACE

For production as well as laboratory use in such operations as: the production of refractory metals through hydride decomposition, sintering of Tantalum anodes and high temperature ceramic reactions. This KINNEY High Vacuum Furnace fulfills the needs of applications where very low pressures and residual atmosphere of high purity are required. Write for full information on this and other new developments in KINNEY High Vacuum Furnaces.

KINNEY VACUUM DIVISION
THE NEW YORK AIR BRAKE COMPANY
3601C WASHINGTON STREET • BOSTON 30 • MASS.

WRITE: for Bulletin No. 4510 Describing New Developments in Kinney High Vacuum Furnaces.

Please send me Bulletin No. 4510 and full information on KINNEY Sintering Furnaces.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

Circle No. 41 on Reader Service Card

published monthly, copyright 1960 by

THE INDUSTRIAL PUBLISHING CORP.

Editorial and executive offices: 812 Huron Rd., Cleveland 15, O.

IRVING B. HEXTER.....*president*
LESTER P. AURBACH....*executive v.p.*
EDWIN M. JOSEPH ..*1st vice president*
E. J. HEXTER.....*vice president*
LEE HAAS .....*vice president*
CHARLES F. GEYER ....*vice president*
N. N. GOODMAN, JR. ....*vice president*
PAUL ROLNICK .....*vice president*
ALAN J. KICHLER....*ass't. sec'y-treas.*

STAFF

David W. Veit ....*publishing director*
Philip R. Kolischer.....*editor*
Ronald Khol .....*assistant editor*
Scholer Bangs .....*western editor*
672 So. Lafayette Park Pl.
Los Angeles 57, California
Henry Lefer .....*eastern editor*
Rm. 835, 60 E. 42 St.
New York 17, N. Y.
Alaric Mousser .....*art director*
N. G. Kiser .....*circulation manager*
R. V. Block ..*mgr. reader service dept.*

SALES OFFICES

Cleveland 15
812 Huron Rd., SU 1-9620
ROBERT SIMMONS

New York City 17
Rm. 835, 60 E. 42 St. MU 7-3420
LEE HAAS *manager*
ARTHUR L. GOEBEL

Chicago 11
Rm. 704, 520 N. Michigan,
WH 3-1655
CHARLES F. GEYER *manager*
KENNETH L. JONES

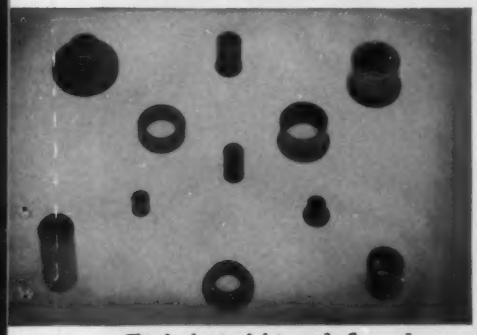
Los Angeles 57
672 S. Lafayette Park Pl.,
DU 7-5104
ALAN T. CAZIER *manager*
LLOYD BROOKMYER

London, S.W. 1
31 Palace St., Westminster,
VI 2608
JOHN A. LANKESTER *manager*

SUBSCRIPTIONS in U.S. and possessions: $7, 1 year; $12, 2 years. Canada: $8 per year. Foreign: $10 per year, payable in advance in U.S. funds. U.K.: £3.5.0 per year payable in Sterling to London office. Single copies, when available: 1 to 10 — 75¢ each; 11 to 25 60¢ each; over 25 45¢ each.

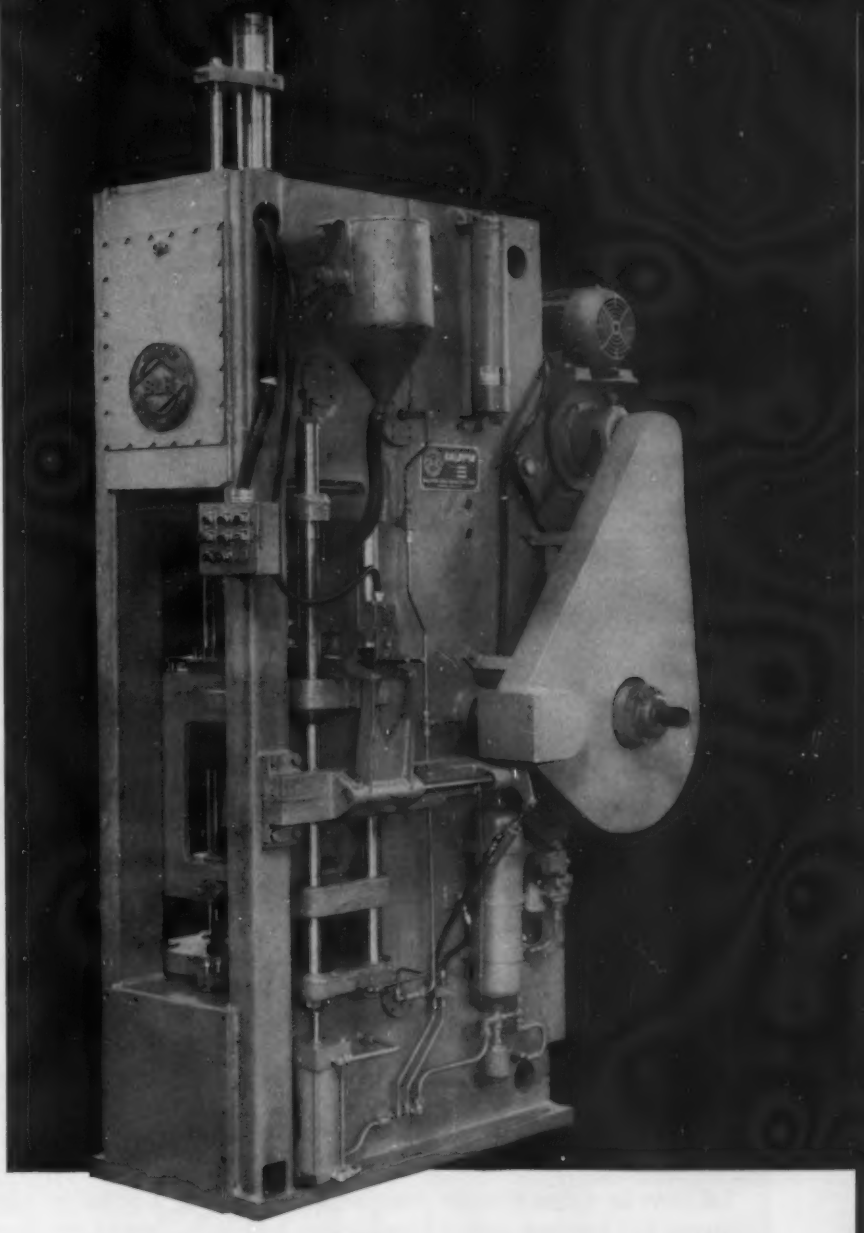
AFFILIATED PUBLICATIONS: Applied Hydraulics & Pneumatics. The Refrigeration & Air Conditioning Business, Material Handling Engineering, Material Handling Illustrated, Modern Office Procedures, Occupational Hazards, Power Transmission Design, Welding Design & Fabrication, Welding Illustrated. Member BPA.
Accepted as a controlled circulation publication at St. Joseph, Michigan.
Not responsible for unsolicited editorial material. Please return Forms 3579 to 812 Huron Rd., Cleveland 15, Ohio.
Printed in the U.S.A.

Fabricated parts and gears formed on Baldwin Compacting Presses.



Typical straight and flanged powdered metal bushings made on Baldwin Compacting Presses.

Other parts being made at United States Graphite on Baldwin presses. The double hub and counterbored parts are test pieces. Others are production items.



Here is a low-cost compacting press specifically designed to meet your needs

Baldwin-Lima-Hamilton Corporation's 100 years' experience and know-how in designing and building hydraulic presses has been incorporated into the 50W low-cost compacting press.

Its 1-piece frame and floating die deliver the same uniform pressure, the same rigid 4-point guiding, as our regular heavy duty 4-column hydraulic presses. The 50W is designed for versatility—extra motions may be added as requirements become more complex, without the need for additional machining.

Rated pressure of the Baldwin Model 50W is 50 tons, with a 25-ton ejection capacity. Stroke is adjustable through its entire fill range of 0 to 4½ in. For complete details, write to the Industrial Equipment Division, B-L-H Corporation, Philadelphia 42, Pa.

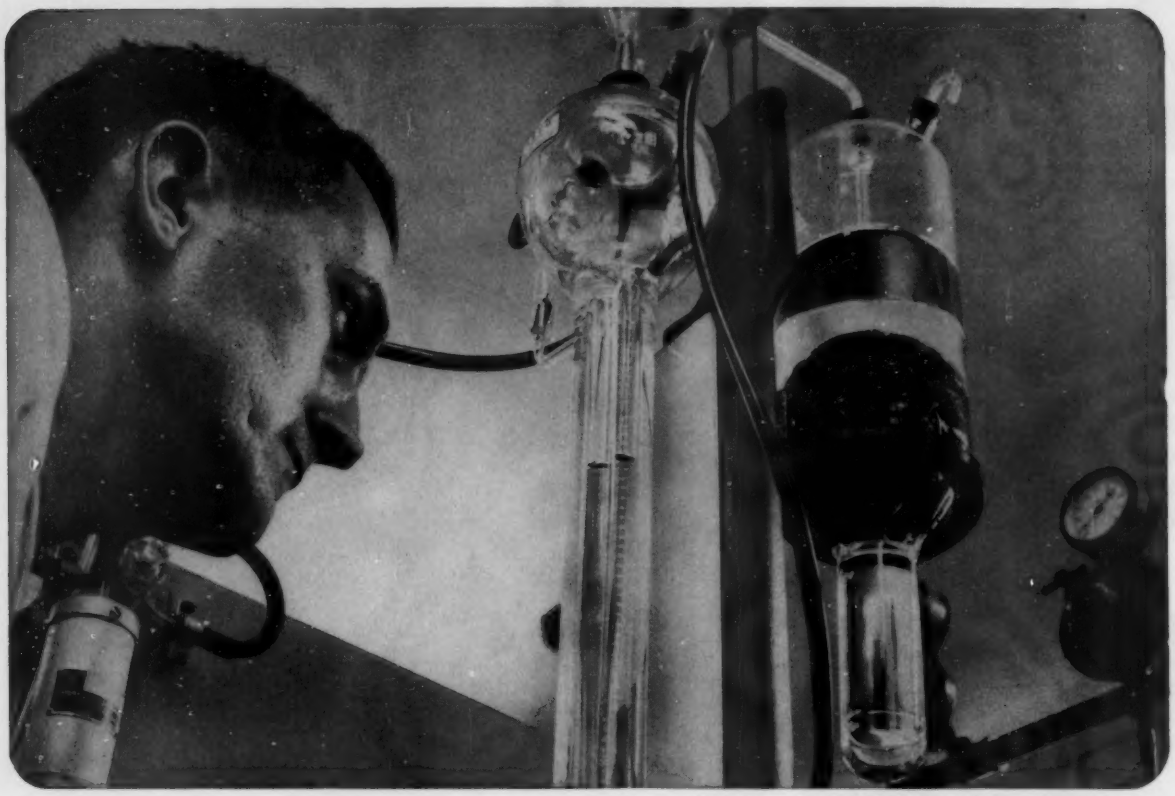
BALDWIN · LIMA · HAMILTON

Industrial Equipment Division · Philadelphia 42, Pa.

BALDWIN BLH LIMA-HAMILTON

Circle No. 11 on Reader Service Card

Experience—*the added alloy in* ***Allegheny Ludlum*** *tool steels*



QUICK, FAST TESTING for carbon content is done not once or twice but 8 times per melt in A-L's Chem Lab with this direct reading Leco carbon determinator.

Carbon content checked 8 times during melt to guarantee A-L tool steel hardenability

Lab tests for carbon eliminate your guesswork; provide high hardness, uniform hardenability, reproducible tool performance.

Because carbon has the greatest influence on hardenability, Allegheny Ludlum watches it carefully during the melt. Testing a specimen for carbon takes only a few minutes. Therefore, A-L checks for carbon content 8 times during the melt, and makes the necessary adjustments to insure accurate control of carbon. This control means Allegheny Ludlum can hold carbon content to a closer range than most customers specify.

Carbon control at Allegheny Ludlum assures you of precise response to heat treating. This control in the melt brings you predictable, *high hardness, uniform hardenability* and *reproducible tool performance.*

This is just one of the many things A-L does to insure high quality. Here are some others: close control over forging techniques, rigid temperature-time programming, careful testing of billets prior to processing to insure good surface and sound interior, control over annealing to give you the right hardness for your exact machining operation, thorough metallurgical testing to insure top tool steel quality and meeting of your specifications.

Allegheny Ludlum stocks a complete line of tool steel sizes and grades. Call your nearest A-L representative; you'll get quick service and counsel on such problems as heat treating, machining, grade selection, etc. Or write for A-L's publication list which gives full data on the more than 125 technical publications offered. They'll make your job easier.

ALLEGHENY LUDLUM STEEL CORPORATION, Oliver Bldg., Pittsburgh 22, Pa. Address Dept. PM-27

WWW-7281

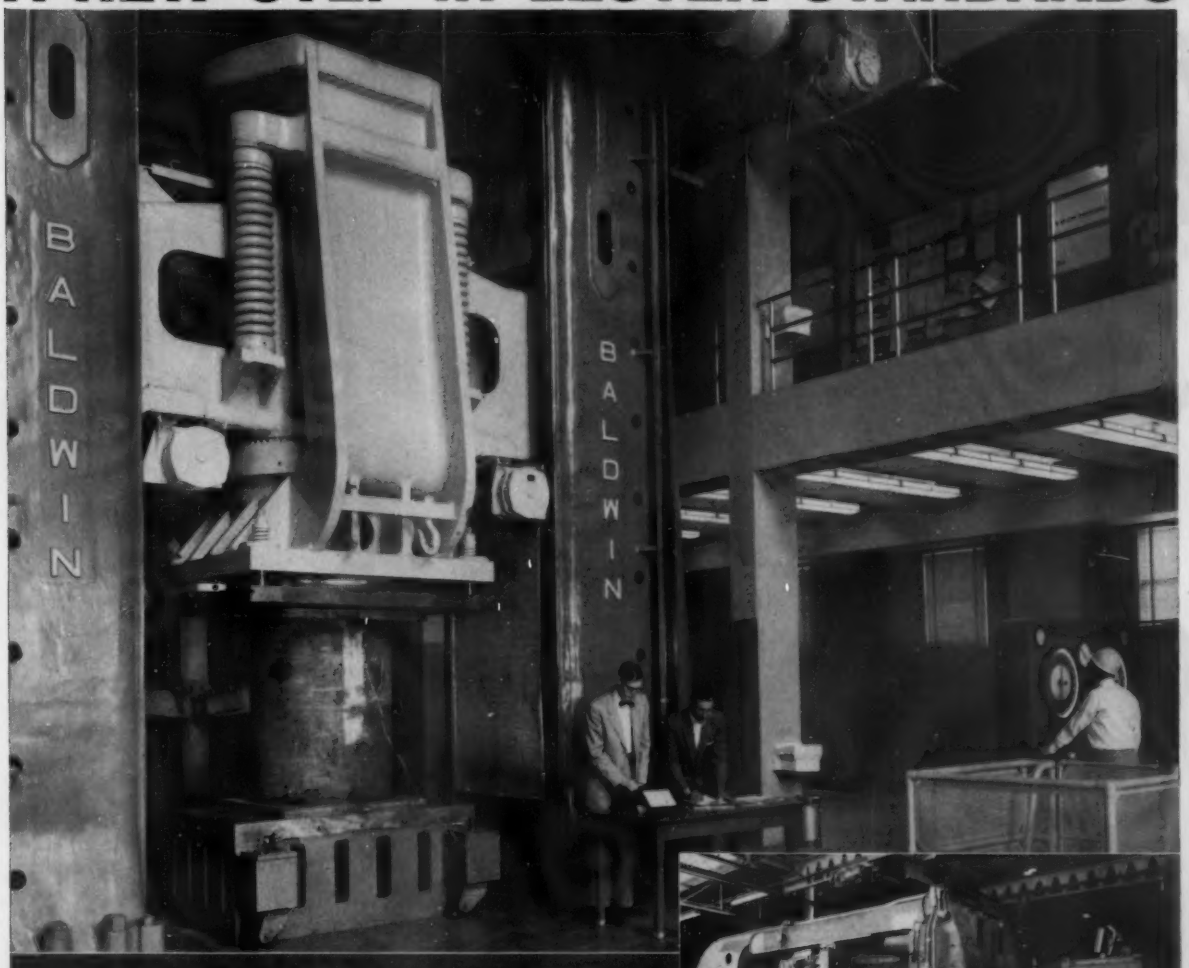
ALLEGHENY LUDLUM

Tool Steel warehouse stocks throughout the country... Check the yellow pages

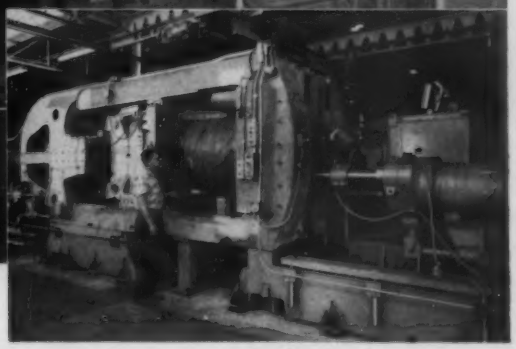
every grade of tool steel... every help in using it

Circle No. 5 on Reader Service Card

A NEW STEP IN LESTER STANDARDS



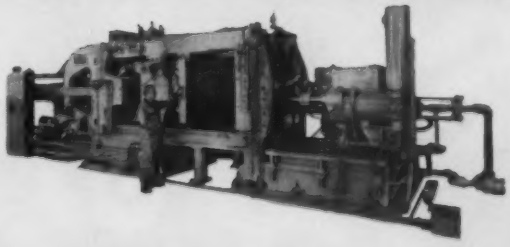
Read how 5,000,000 Lb. University Test Backs Up LESTER Locking Ratings...



A machined ring is squeezed between the jaws of a giant testing machine (capable of exerting 5 million pounds of pressure) at Lehigh University. Readings at various pressures are taken by an independent engineer. This ring is, in turn, locked between the platens of our machines and the comparison readings certify the clamping tonnage.

Why do we do it?

Because we know that the heart of controlling the quality of die cast parts is the ability of the machine to develop and *hold* its full rated locking tonnage. Only with the one-piece cast alloy frame, an exclusive feature of Lester machines, is this tonnage assured for the life of the machine. No torque, no twist, no wear, no adjustment. Just rigid, dependable, *certified* clamping tonnage.



WRITE TODAY FOR FULL SPECIFICATION ON THE LESTER OF YOUR CHOICE
Circle No. 69 on Reader Service Card

LESTER-PHOENIX, INC.

2708-T CHURCH AVENUE • CLEVELAND 13, OHIO
Agents in principal cities throughout the world

DIE CASTING MACHINES

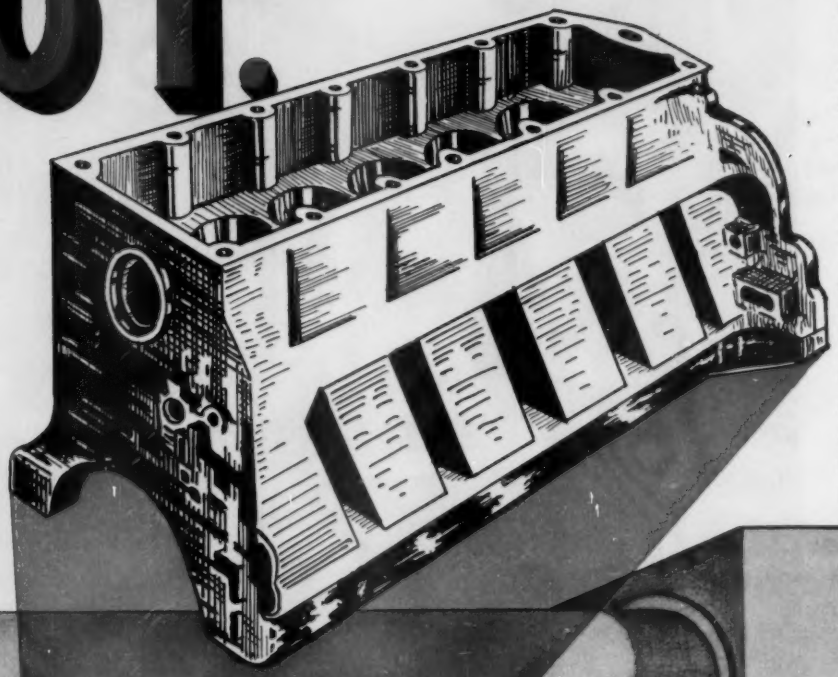
clamping force:

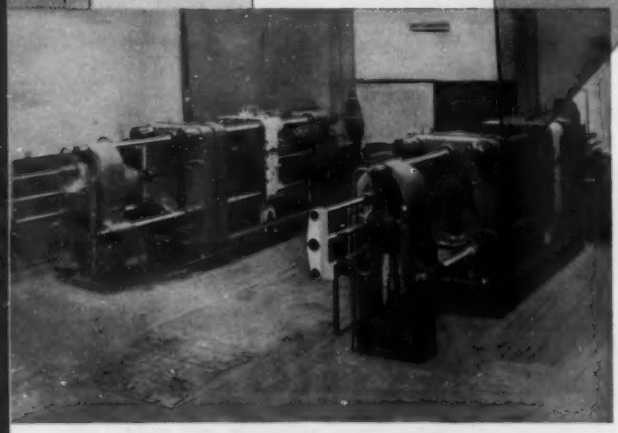
2500 T.

hydro-mechanical clamping

LARGE PLATENS

BIG ROOM





CHARACTERISTICS

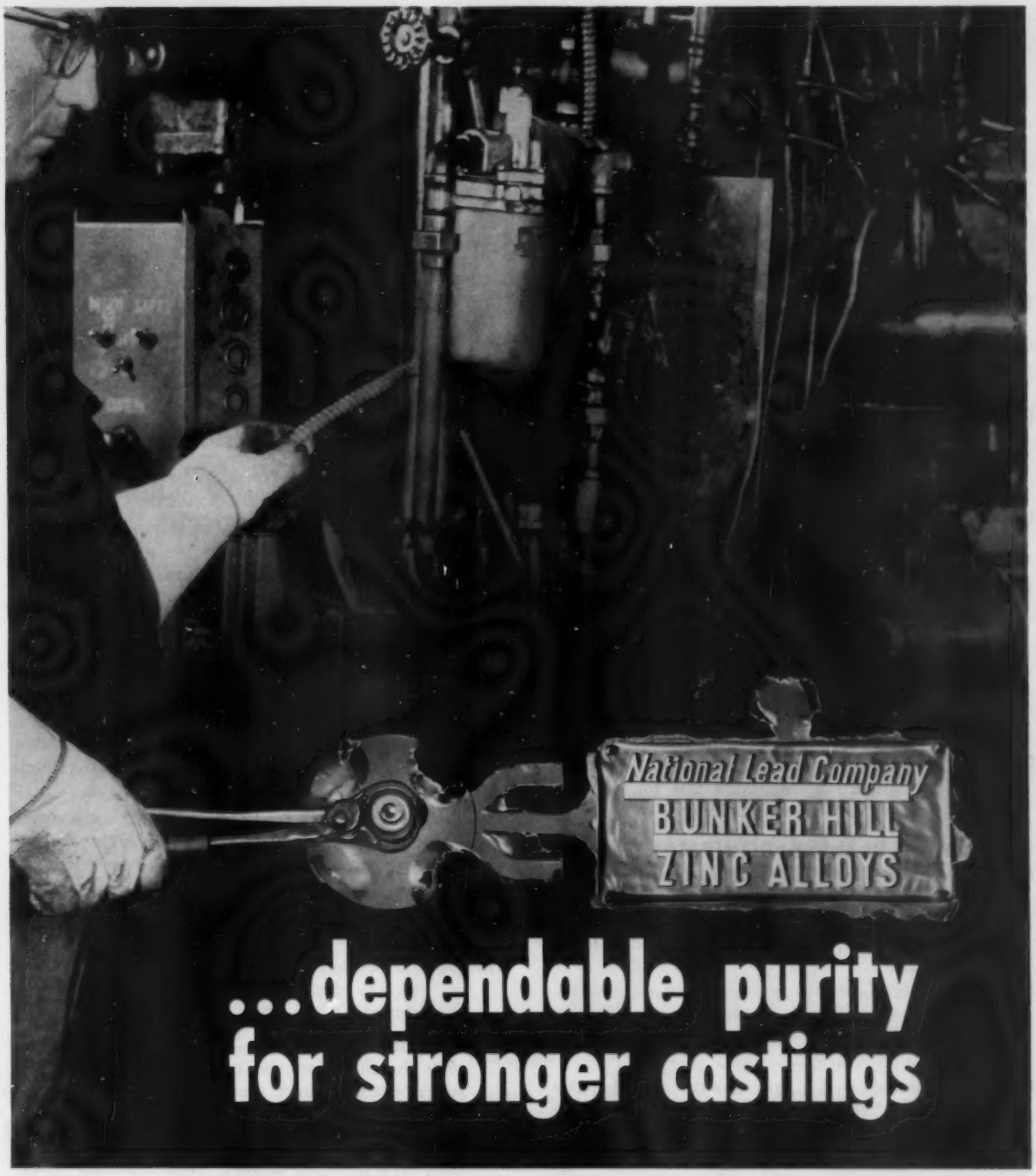
Clamping force	(Short Tons)	2500
Max. room between open platens	in.	100
Stroke of moving platen	in.	60
Useful size between platens	in.	78
Thickness of die max.	in.	60
Thickness of die min.	in.	40
Useful size between tie bars (vertical)	in.	52
Injection capacity (based on Al.)	up to 100 lbs.	
Specific pressure on the material	up to 28200 lbs/sq. in.	

TRIULZI

NOVATE (MILANO) ITALY

Via Vialba 56 - Telefoni: 3.491.661/2/3/4 - 3.491.765/6/7/8
Indirizzo Telegrafico: TRIULZIPRES - NOVATE MILANESE

Circle No. 72 on Reader Service Card



...dependable purity for stronger castings

Purity *beyond* the industry standard . . . that's what you get with ***National Lead*** Bunker Hill Zinc Alloys.

They more than meet ASTM and SAE specifications for freedom from contaminants. You can expect – and get – sound, uniform, high-strength castings that need very little machining. And, because they're free from porosity, ***National Lead*** Bunker Hill Zinc Alloys trim, punch, tap and broach cleanly . . . accept plating or other finishing with little or no preparation.

So, for fast, continuous production with a reduced reject count, remember that it pays to start with ***National Lead Company*** Bunker Hill Zinc Alloys – dependably uniform, dependably pure. You'll please your customers *and* your accountants! To order, simply call us.

National Lead Company

General Offices: 111 Broadway
New York 6, N. Y.
Offices in principal cities

Circle No. 93 on Reader Service Card

USEFUL LITERATURE, CATALOGS, MANUALS

Qualified readers may obtain any of these technical publications free by circling the numbers on the Reader Service Cards facing page 90

PROCESSES

145 Electroforming — ALLIED RESEARCH & ENGINEERING — 32-page technical handbook gives charts, data tables, and engineering design information on the electroforming process.

146 Sintering — MICRONIZED METALS, INC. — 4-page technical brochure lists steps in producing sintered parts from stainless steel powders. Includes detailed mechanical, physical and chemical property tables.

147 Castings — MEEHANITE METAL CORP. — 4-page technical bulletin gives a tabular summary of the mechanical and physical properties of permanent mold and die castings.

148 Aluminum Castings — THE ALUMINUM ASSOC. — 16-page technical booklet tells how aluminum foundries estimate casting weights.

149 Electroforming — ALLIED RESEARCH & ENGINEERING DIV. — "Tech Notes from Allied", is a new technical newsletter featuring news and developments in electroforming.

29 Investment Casting — HITCHINER MFG. CO. — 13-page technical brochure explains the ceramic shell investment casting process.

151 Chromallizing — CHROMALLOY CORP. — 2-page technical bulletin gives design tips for parts to be surface alloyed by chromallizing.

MATERIALS & EQUIPMENT

152 Billet Heater — AJAX MAGNETHERMIC CORP. — 4-page technical bulletin tells how to produce more and better aluminum extrusions with an induction billet heater. Includes data on cost and thermal characteristics.

153 Surface Standards — BRUSH INSTRUMENTS — 12-page reference manual contains excerpts on surface roughness, waviness and lay from ASA B46.1-1955.

154 Trig Functions — J. T. SLOCOMB CO. — Pocket-size chart of trigonometric functions has reference formulas and diagrams of common problems.

155 Stainless Steel Filters — MICRO METALLIC DIV., PALL CORP. — 4-page technical booklet gives properties and specifications of stainless steel filters.

156 Pumps and Controls — DENISON ENGINEERING DIV. — 72-page catalog describes design details and operating characteristics of a line of hydraulic pumps, fluid motors and valves.

157 Lubricants — JOSEPH DIXON CRUCIBLE CO. — 11 pages of technical data on die and press lubricants for the metal molding industry.

158 Punch Presses — KENCO MFG. CO. — 4-page illustrated bulletin describes a line of variable shut height presses from 2 to 18 tons capacity.

67 Decorative Moulding — WILLIAM L. BONNELL CO. — Brochure gives information on a line of clear and gold anodized extruded mouldings available in a variety of decorative surface finishes.

159 Extrusions — WILLIAM L. BONNELL CO. — 64-page book describes extruding facilities and lists extrusions and decorative mouldings available.

160 Fastening Methods — REYNOLDS METALS CO. — 32-page illustrated book shows the best ways to mechanically join aluminum parts. Gives design data.

161 Mold Release Compound — ALKYLL CHEMICALS, INC. — Technical data on a mold release compound for the dependable release of zinc die castings.

162 Aerosols — SPRAYON PRODUCTS, INC. — Handbook "Aerosols for Industry" describes a line of spray on protective coatings, special lubricants, degreasers, standard machinery finishes and lay-out fluid.

163 Impression Stamping — ACROMARK CO. — 4-page illustrated brochure describes the Hercules line of type holders for impression stamping.

164 Circuit Overload Detector — WINTRESS, INC. — Data on the Circuit Master Mark III overload detector that eliminates die damage due to overload misfeed, buckling, pile-up, etc.

165 Portable Pumping Systems — NRC EQUIPMENT CORP. — Technical data on portable high-vacuum systems that are caster mounted.

166 Adhesive Bonding of Aluminum — REYNOLDS METALS CO. — Technical booklet on structural adhesives for bonding of aluminum.

167 Die Lubrication — THE DEVILBISS CO. — Data sheet on specially designed automatic spray guns for die lubrication.

168 Analytical Instruments — JARRELL-ASH CO. — 8-page brochure on the company's photographic spectrographs, direct reading spectrometers, and other analytical instruments.

169 Resistor Wire — HOSKINS MFG. CO. — Technical data on a new low density, high resistivity Alloy 815-R Precision Resistor Wire is given in a 12-page catalog.

170 Steel Stamps — ACROMARK CO. — Brochure gives specifications on heavy-duty steel letters and figures for marking castings, alloy steels, and all unhardened metals and materials.

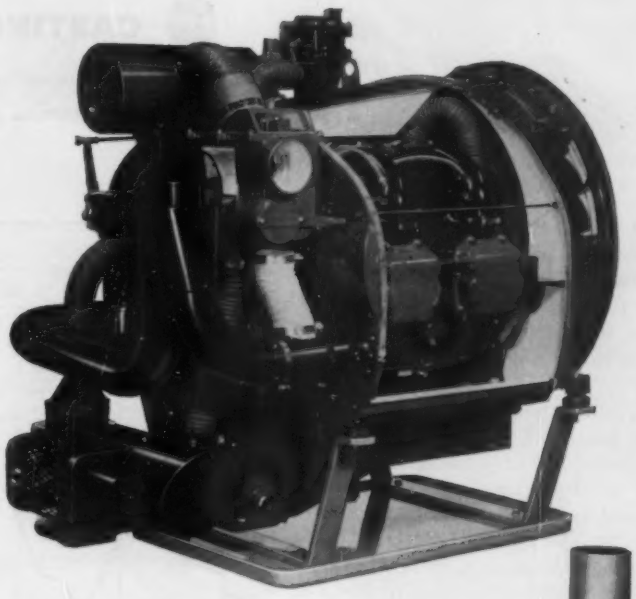
171 Vacuum Gauge — NRC EQUIPMENT CORP. — Technical literature describes a small, battery-operated thermocouple gauge for pressures from two millimeters of mercury down to one micron.

Continued on page 68

FLANGES cast by Misco MONO-SHELL

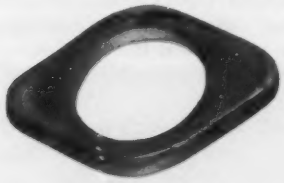
for Exhaust Manifolds of PE90-2 PACKETT ENGINE

Save TIME! Reduce COSTS! Improve PERFORMANCE!



Misco recently helped a major sub-contractor of Continental Motors Corporation solve the problem of producing flanges for the exhaust manifolds of Continental's PE90-2 Packett Engine. Over 65,000 Misco flanges have been produced for 15 engines produced by Continental Motors.

SAE 1010 stampings were found unsatisfactory, and AISI 347 stainless steel flanges for improved performance could not be economically fabricated by stamping or shell mold casting. AISI 347 flanges were then cast by Misco MONO-SHELL improving quality and reducing costs.



STAMPING

Part required machining to correct warpage. Three holes required machining. Edges required finishing. Stamping die wear was excessive and die costs high. Four men and machines were required for machining. A large stamping inventory was needed to meet production needs. Part quality was inconsistent causing rework at assembly.

SHELL MOLD CASTING

Three holes required machining. Flange thickness and edges required finishing. Machining costs not reduced. Inventory reduction was the only advantage over stamping.

MONO-SHELL CASTING

Holes are cast to size. Flanges are ready for assembly as delivered, reducing inventory. Tooling costs were less than half of that required by other two methods. The MONO-SHELL flanges incorporate all of these advantages at a 15 per cent reduction in total flange cost.

Send us your inquiries, details of your requirements, or parts for quotation.

Misco Precision Casting Company

Plants in
WHITEHALL, MICHIGAN
MUSKEGON, MICHIGAN

MISCO

Address inquiries to
122 Gibbs Street
WHITEHALL, MICHIGAN
TWinoaks 3-1515

MONO-SHELL

Sales Offices in Principal Cities

PRODUCERS OF AIRCRAFT AND INDUSTRIAL INVESTMENT CASTINGS

Circle No. 38 on Reader Service Card

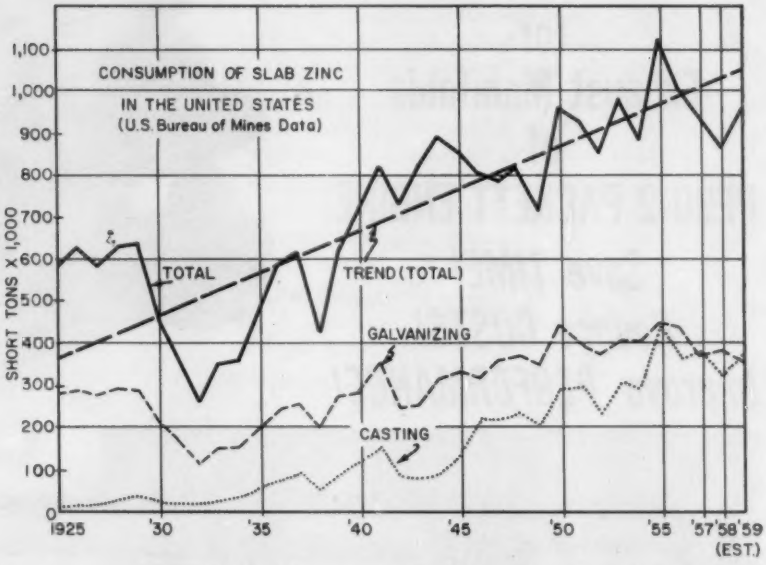
CASTING ABOUT

technical news of applications & process involving precision metal molding

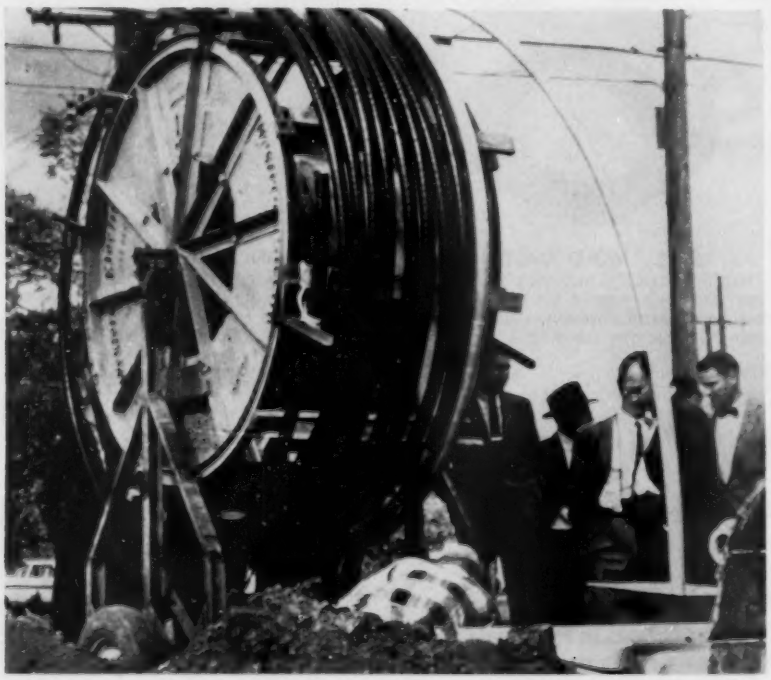
FOR THE SECOND TIME in recent years, the tonnage of zinc used for die casting topped galvanizing. This probably is due to the effect of the steel strike which shut down all, or nearly all, of the galvanizing lines.

Based on the first ten months reports, John L. Kimberley, executive vice-president of the American Zinc Institute, predicts an overall increase in the consumption of zinc for 1959. The AZI estimate for the total year shows a gain of 75,000 tons over 1958 for a total of 944,000 tons. This figure, which checks the 940,000 ton estimate of the Business and Defense Services Administration, is a gain of 8.7% over 1958. In the past ten years only 1950, 1953, 1955 and 1956 have shown higher consumption figures.

The decline in galvanizing was more than offset by a sharp rise in zinc consumed for brass (up 29.6%) and die casting (up 16.3%). Other uses of zinc were about the same as the year before.



With the 1960 automobile production predicted as the second largest in the industry's history, the consumption of zinc this year could set an all time record, or at least come close to the record set in 1955.



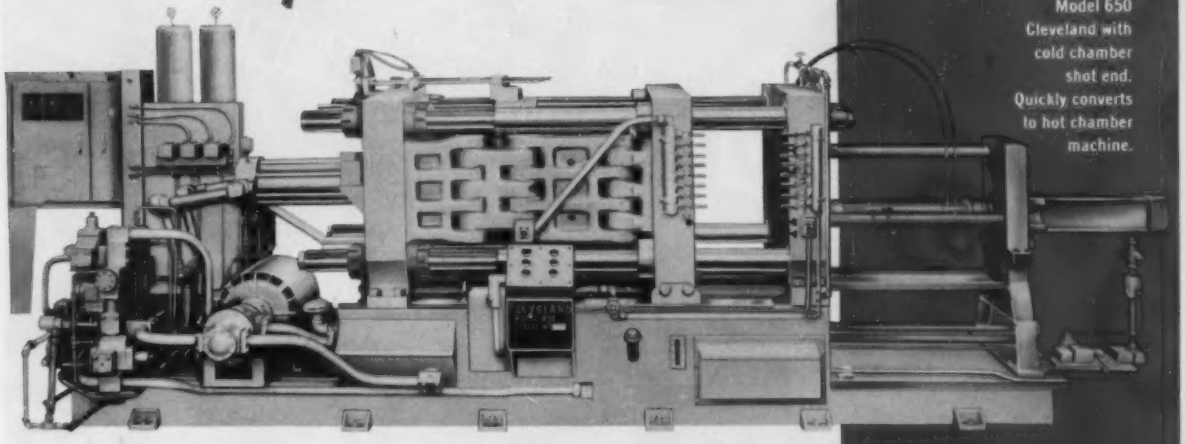
BECAUSE OF ITS CORROSION RESISTANCE, aluminum pipe has many advantages for underground lines. This was the basic reason for developing a method for rapid laying of 2" schedule 5 aluminum pipe. A 42" deep trench is dug, the pipe layed and the trench backfilled, all in one operation and at a rate of three miles per hour. The extruded pipe is made by the Aluminum Co. of America at its Lafayette, Ind. plant. The pipe laying equipment has a capacity of one-mile of coiled pipe per load.

The installed cost of extruded pipe is nearly one-half the cost of installed steel pipe. It is expected that a wide market will open for flow lines and gathering lines because of the low cost of installing the pipe.

Welded joints, externally protected with tape, present no installation problem. The welded joint feeds smoothly and lays easily.

Take a close look...

FOR ALUMINUM OR ZINC DIE CASTING



Model 650 Cleveland with cold chamber shot end. Quickly converts to hot chamber machine.

at the model 650 CLEVELAND

Cleveland's Model 650 brings to die casters a major advancement in die casting machine design. Its dozens of highly important features — many are exclusively Cleveland's — insure exceptional performance in delivering castings of precision quality at a fast production rate.

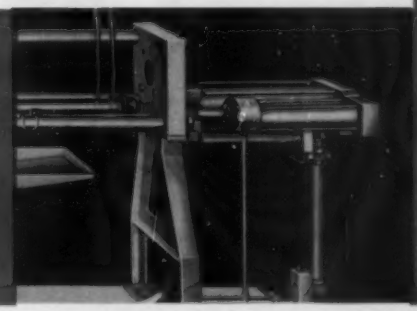
The "650" is *massive*—with guaranteed 650-tons locking pressure (strain gage tested). Maximum weight of shot is 10.6 lbs. aluminum and 25.8 lbs. zinc. It has 46½" x 46" die plates; 28" x 28" space between the tie bars; 30" max. to 10" min. die thickness; 8" to 15" die opening.

Only a few "650" features are illustrated here, but these are typical of Cleveland's all-over quality construction. For full details, call in a Cleveland sales engineer and write for descriptive bulletin.

New hot chamber shot end. Improved cast steel shot cylinder and gooseneck supports permit quick gooseneck removal. High pressure swivel joints in hydraulic lines.

Plus: Automatic timing controls separate from machine, with push buttons convenient for operator's control . . . heavy, one-piece, machine-length base . . . extra rugged platens and toggles . . . dual accumulator system . . . manifold hydraulics . . . automatic lubrication . . . many other important construction features.

30 hp. totally enclosed motor drives two Vickers pumps which deliver 99.7 gal. per min. The 200 gal. hydraulic reservoir has filter capacity twice the pump capacity.



New shot intensifier. Will provide plunger speeds up to 480 ft./min. and pressures up to 26,070 lbs./sq. in. (Both are adjustable.)

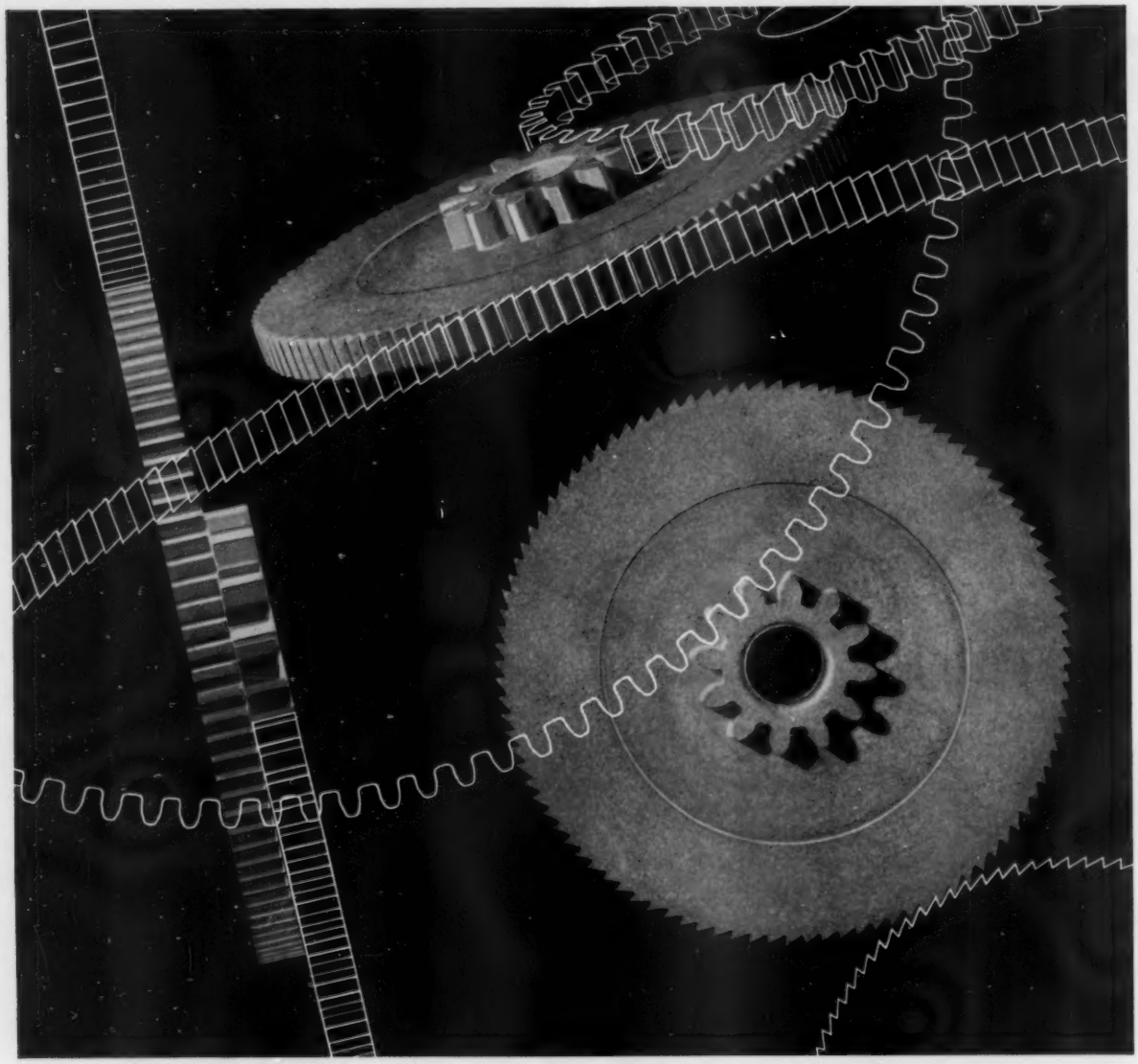
REMEMBER,
Clevelands Cut Costs!

Sales Offices: Chicago • Cleveland • Detroit • Hartford • Springfield, N. J.

CLEVELAND AUTOMATIC MACHINE COMPANY
4952 Beech Street • Cincinnati 12, Ohio

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

Circle No. 16 on Reader Service Card



Gear up for economical production of higher strength parts with...

REPUBLIC HS6460 HIGH STRENGTH POWDER

HS6460 can be used to produce comparable strength structural parts at lower manufacturing costs than obtainable with copper infiltration. Additional production economies can be achieved because fewer operations will be required with HS6460 to obtain high density, higher strength parts.

HS6460, a soft, alloy powder is ideally suited for use in all major powder metallurgy applications. It is capable of a minimum tensile strength of 60,000 psi at 6.4 density—100,000 psi after heat treatment. The powder's excellent carbon compatibility enhances its ability to be heat treated.

If you are interested in producing higher strength parts at less cost, write Republic Steel, Dept. PM-9003, 1441 Republic Building, Cleveland 1, Ohio.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

Circle No. 88 on Reader Service Card

These L.D.C. Aluminum Die Castings help keep a marine radar system on the beam

Indicator Unit of the new Sperry Radar 5. Control housing and indicator frame are L.D.C. corrosion-resistant aluminum alloy.

There's no guesswork with the new Sperry Radar 5, the navigating aid and anti-collision device for small boat operators. It enables the pilot to obtain relative bearings of other vessels and objects within range . . . allows the navigator to sight land falls . . . offers greater safety at night and during bad weather.

Reliability and diversity of the Sperry Radar 5 are made possible through modern design and precision engineering, sparked by complex and quality-proven parts . . . that include L.D.C. corrosion-resistant aluminum alloy die castings.

Latrobe Die Casting Co.
Latrobe, Pennsylvania

DISTRICT OFFICES:

AKRON, OHIO
E. G. Sies, Jr.
227 W. Exchange St.
Tel: Portage 2-7663

CLEVELAND, OHIO
William Kranz
20001 West Lake Road
Tel: Edison 1-6888

DETROIT, MICHIGAN
J. R. Lemen, Jr.
1016 Fisher Bldg.
Tel: Trinity 3-5910

NEW ENGLAND
R. L. Thomson
471 Glenbrook Rd.,
Glenbrook Station
Stamford, Conn.
Tel: Fireside 8-3985

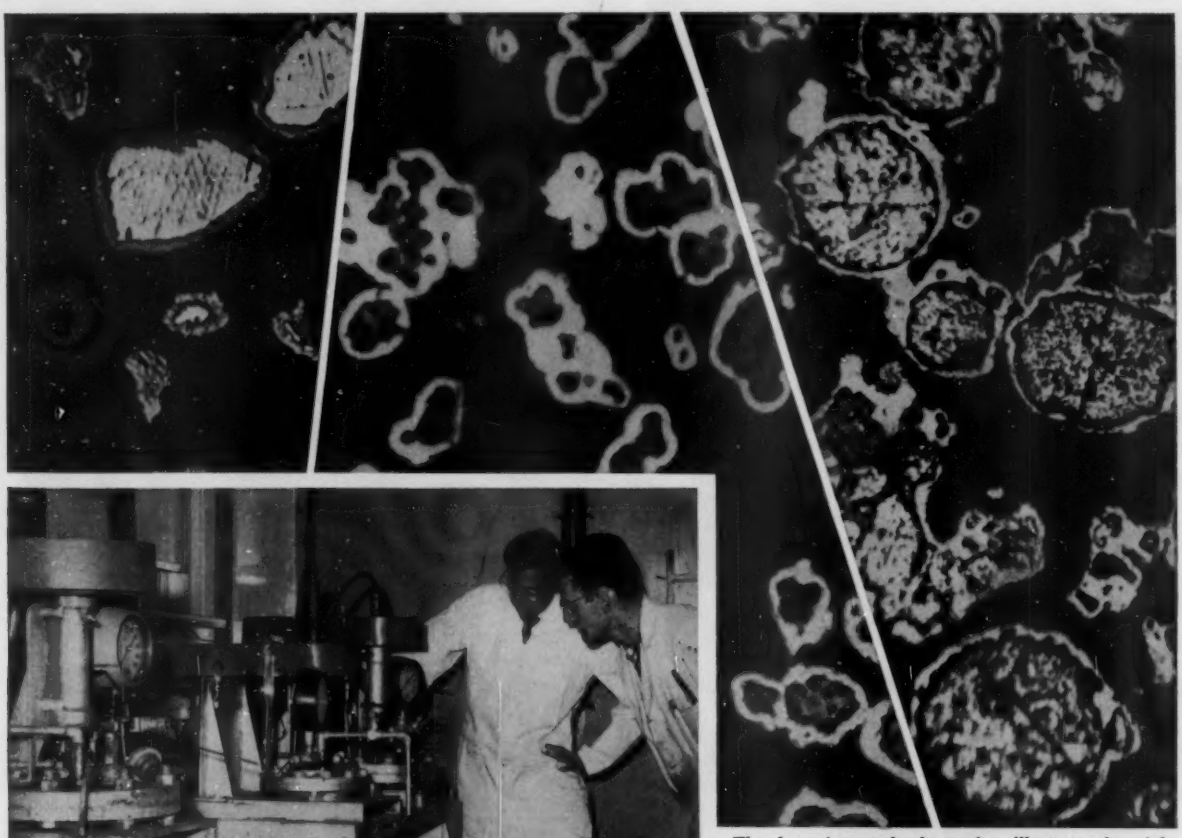
BUFFALO, N.Y.
Harry W. Harding
235 Burke Drive
Tel: Amherst 1164

DAYTON, OHIO
J. M. Gallaher
363 West First St.
Tel: Baldwin 4-3523

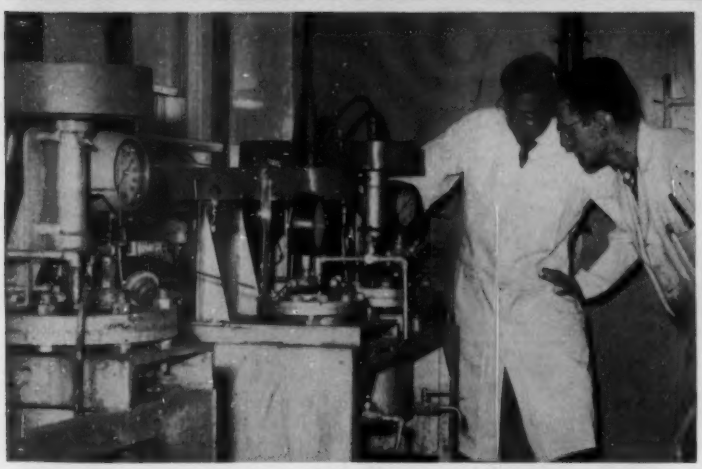
PHILADELPHIA, PA.
Albert B. Reid
505 Wadsworth St.
Tel: Chestnut Hill 7-8833

Established 1918

Circle No. 34 on Reader Service Card



The photomicrographs shown above illustrate a few of the many coated metal powder combinations made possible by Sherritt's patented coating process: (left to right) nickel on chromium, copper on nickel, and nickel on iron.



New metal coating techniques developed by the Sherritt Research Staff have greatly advanced the art of solid state alloying in powder metallurgy. These patented techniques permit controlled coating of minute metal or non-metal powders with pure nickel or cobalt.

By these new techniques metal powders sensitive to oxygen contamination while in process can now be protected by a continuous coating of nickel. The coating is intimately bonded over the entire particle surface so that compacts can be produced from a completely "nickel-plated" metal powder.

Perhaps the most significant contribution of the Sherritt developments to the art of powder metallurgy is the production of the metal/non-metal combination powders. With control of the coating completely in the hands of the metallurgist, the number of possible metal/non-metal combination powders suitable for compacting applications becomes almost unlimited.

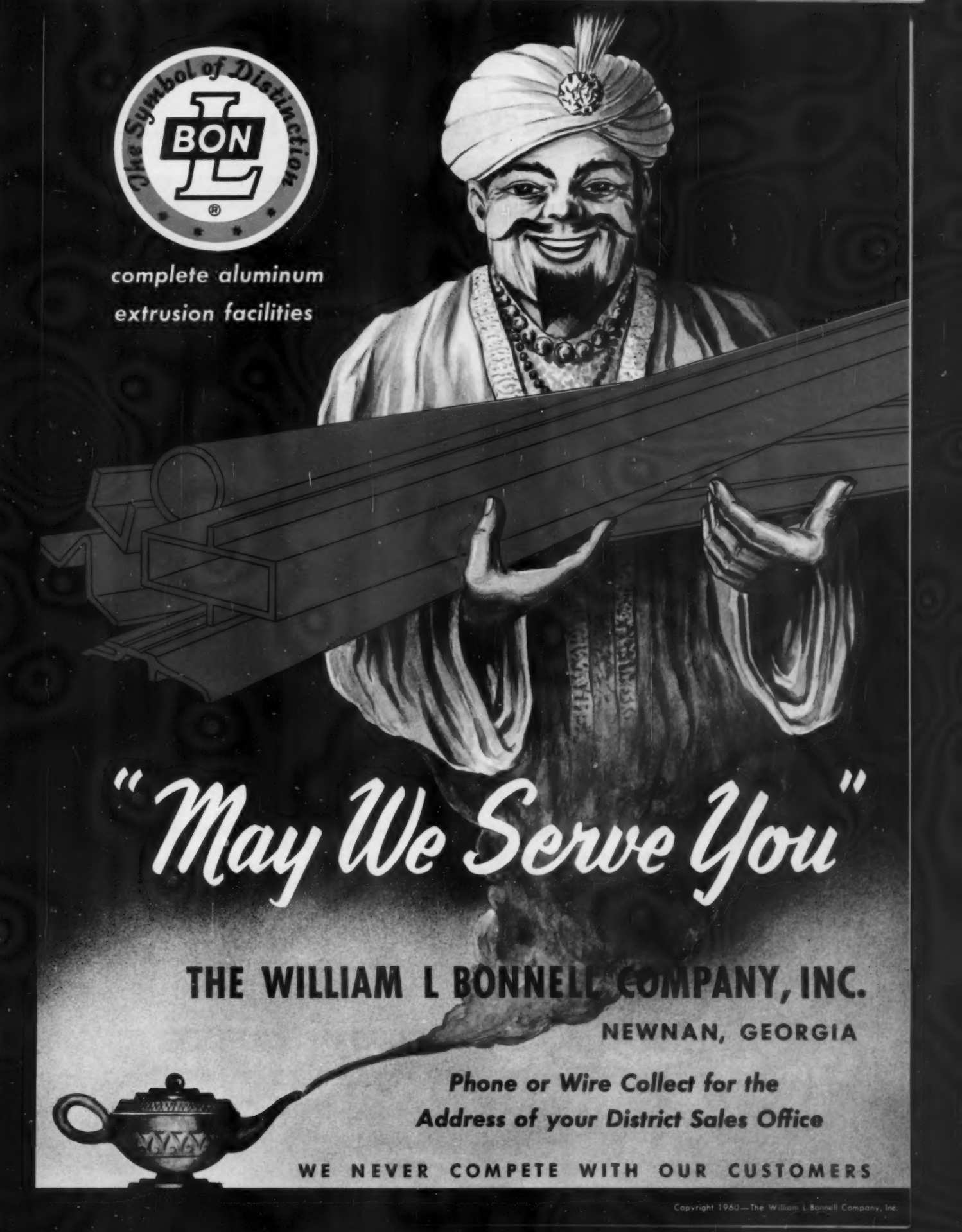
new techniques for solid state nickel alloying

SHERRITT

FOOTE MINERAL COMPANY is the exclusive sales agent for Sherritt nickel and cobalt in the United States and Canada. For product literature, prices, and delivery information, contact the Foote Mineral Company, 474 S Eighteen West Chelten Building, Philadelphia 44, Pennsylvania.

SHERRITT GORDON MINES LIMITED

Circle No. 86 on Reader Service Card


The Symbol of Distinction
BON L
complete aluminum
extrusion facilities
"May We Serve You"
THE WILLIAM L BONNELL COMPANY, INC.
NEWNAN, GEORGIA
Phone or Wire Collect for the
Address of your District Sales Office
WE NEVER COMPETE WITH OUR CUSTOMERS

Copyright 1960—The William L Bonnell Company, Inc.

V-R INVESTMENT CASTINGS . . .

Send for booklet No. VR-470.

DESIGN FLEXIBILITY . . .

provides cost savings by eliminating secondary operations. Irregular surface curvatures, thick and thin sections and shaped internal and external surfaces provide complete design freedom — no need to compromise with production limitations.

ALLOYS TO MEET YOUR NEEDS . . .

V-R investment castings are available in many alloys — such as a cobalt-chromium-tungsten cast alloy, 300 and 400 series stainless steels, ASI 8620 steel, low carbon steels and the beryllium coppers. V-R can develop and cast the proper material to meet the requirements of your application.

CLOSE TOLERANCES ON INTRICATE PARTS . . .

V-R specializes in casting *small* parts — often too small and intricate to be machined economically. Uniform, close tolerances are held throughout the entire production quantity.

METALLURGICAL KNOWLEDGE AND ENGINEERING SERVICE . . .

V-R metallurgists will be glad to study your application and recommend the proper alloy for your parts. Just send us the details of your problem including parts drawings and the requirements for resistance to heat, corrosion and wear.

V-R VASCOLOY-RAMET

CREATING THE METALS THAT SHAPE THE FUTURE

I-736R

808 MARKET ST. WAUKEGAN, ILLINOIS

Circle No. 1 on Reader Service Card

EXTREMELY powerful

AMAZINGLY COMPACT

The Fawcett 3000 Ton Special Purpose Hydraulic Metal-Powder Compacting Press

This is the largest capacity press on the market, yet its dimensions are only 5'7¾" x 4' x 14'2". The Fawcett Compacting Press is designed to produce parts up to 18" in dia. or 254 sq. in., with a maximum filling depth up to 2", or to your particular requirements. It features gentle, smooth handling of components and deflection-free pressure which practically eliminates machining in most instances.

Specifications

Output—80 pressings per hour.

Press Load Dwell—the dwell of the main ram on final compression can be adjusted up to 30 seconds from an automatic timer.

Stripping Load—an adjustable pressure control valve provides the required holding pressure to facilitate the stripping of the moving table.

Press Control—automatic cycle or individual movement from selective push buttons.
A flow control valve is incorporated to give varying approach speeds of the filling die dispenser and main ram.

Press Load—up to 3,360 tons.

Drive—50 H.P. Motor.

Overall Dimensions—the press, including oil supply tank, is 14'2" high, 5'7¾" wide and 4'0" deep. With the motor, pumps and control desk, the machine requires a floor space of 10'0" x 12'6".

Total Weight of press including oil tank, etc. is 35 tons.

FAWCETT PRESTON & COMPANY, LTD.
Bromborough, Cheshire, England

A Member of the Metal Industries Group of Companies

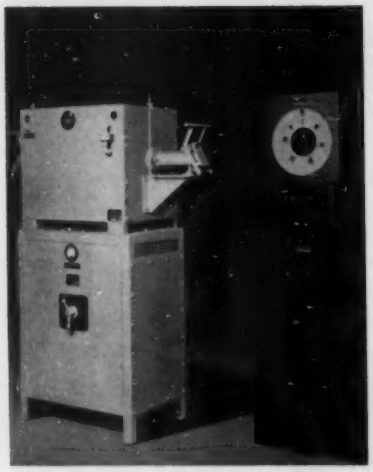
North American Sales & Service Representative

INTERNATIONAL SALES MANAGEMENT CO.
123 North Poplar Street, Charlotte 2, N. C.

Circle No. 80 on Reader Service Card

NEW PRODUCTS AND DEVELOPMENTS

Qualified readers can get complete details on these products. Use the Reader Service Cards. You'll find them facing page 90 of this issue



SINTERING FURNACE DEVELOPS 3000 DEGREES

HARPER ELECTRIC FURNACE CORP. — The modernized line of Globar sintering furnaces features 3000°F heating in either air or controlled atmospheres, including hydrogen. The tubular element units, ideal for many research processes, also have been used economically in the production of small parts requiring brazing, heat treating, and bright annealing.

The outer surfaces of the units remain relatively cool while high working temperatures are maintained inside the element. Gas requirements in the controlled atmosphere models are low since the chamber is small and gas is needed only during the firing of the product. Automatic temperature control systems are available.

Heating chamber sizes are available in lengths to 36″ in either horizontal or vertical models. The operation in horizontal models simulates a production pusher furnace.

Illustrated is a controlled atmosphere horizontal model with stepless power control through use of a saturable core reactor. An on-off transformer control system also is available.

Circle No. 235 on Reader Service Card

PUMP PREVENTS INTERNAL CONDENSATION

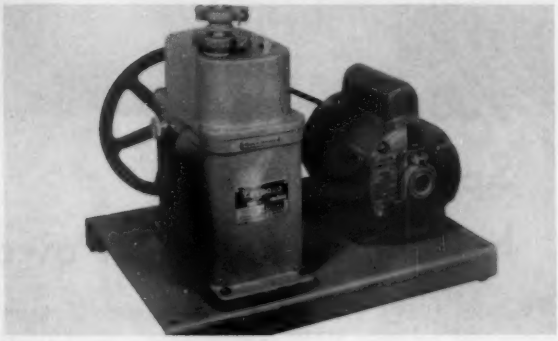
E. LEYBOLD CO. — This rotary gas ballast vacuum pump is equipped with a device which prevents condensation of vapor in the pump.

Capacities of 33 and 100 liters per minute are available in both single and double stage models. All are oil sealed rotary vane type and can be operated with or without the gas ballast device.

The single and double stage pumps have blank-off pressures of 2×10^{-3} and 2×10^{-5} millimeters of mercury.

Built in West Germany, the pumps are distributed in North America by Arthur S. LaPine.

Circle No. 236 on Reader Service Card



LOW COST VIBRATORY FINISHING MACHINE

ALMCO, QUEEN PRODUCTS DIVISION, KING-SEELEY CORP. — The Almco Model VT-72 Vibrasheen vibratory finishing machine is reported to be from 10 to 100 times faster than conventional barrel finishing equipment.

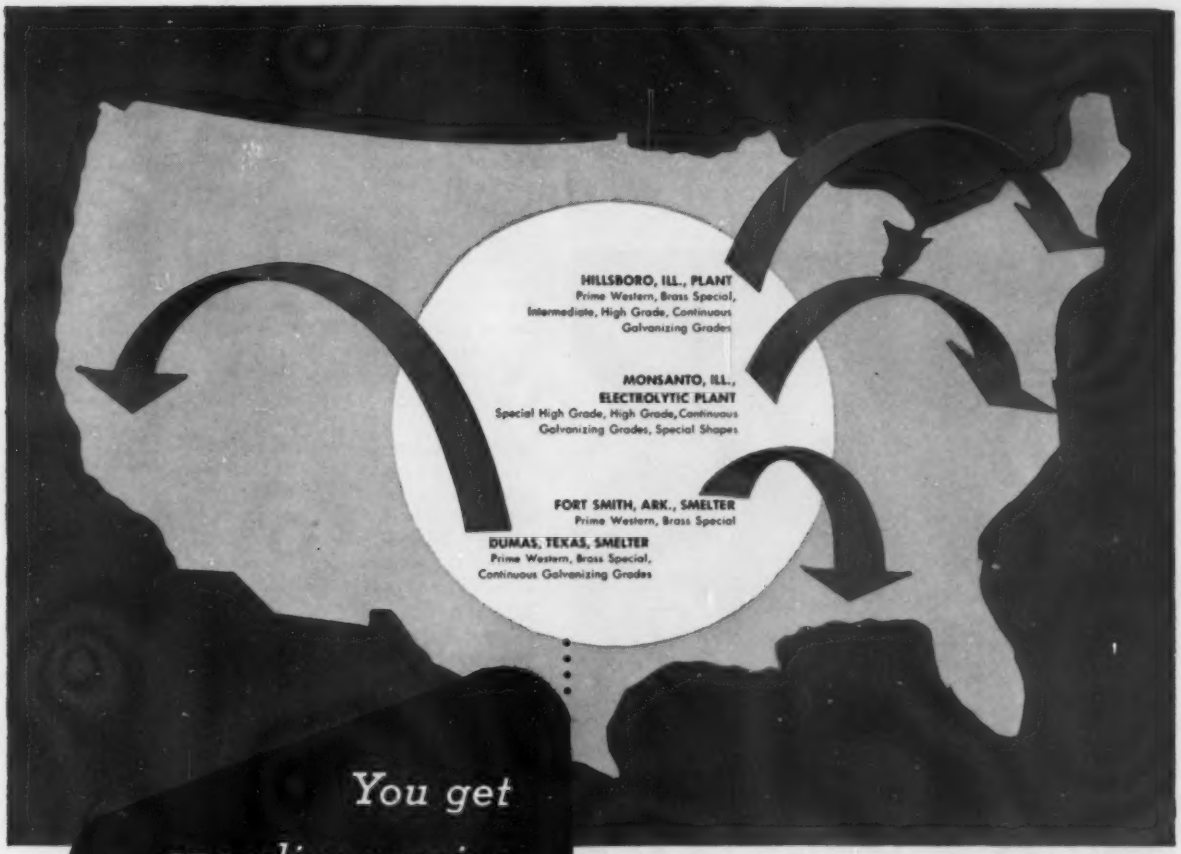
Deburring, descaling, cleaning, burnishing and general surface refinement of metal parts is performed by the moderately high frequency vibration of the parts and media in the tub. This allows the finishing media to enter holes and crevices easily to remove internal burrs.

An air-actuated cylinder pivots the tub through an arc of 130 degrees for easy loading and unloading. Perforations in the drain door permit easy cleaning. Plasticol tub lining makes for long and trouble-free operation.

The unit has a 2½ cu. ft. capacity and a standard vibrating frequency of 3380 cycles per minute. The vibratory mechanism is adjustable for an impact range of from 600 to 2500 lbs.

Circle No. 237 on Reader Service Card

continued on page 63


HILLSBORO, ILL., PLANT
Prime Western, Brass Special, Intermediate, High Grade, Continuous Galvanizing Grades
MONSANTO, ILL., ELECTROLYTIC PLANT
Special High Grade, High Grade, Continuous Galvanizing Grades, Special Shapes
FORT SMITH, ARK., SMELTER
Prime Western, Brass Special
DUMAS, TEXAS, SMELTER
Prime Western, Brass Special, Continuous Galvanizing Grades

You get speedier service from the ZINC ZONE

Central location of American Zinc plants assures prompt deliveries of slab zinc to any point in the nation.

PRODUCERS OF

ALL GRADES OF SLAB ZINC
ZINC ANODES (Plating & Galvanic)
METALLIC CADMIUM
SULPHURIC ACID
LEAD-FREE and LEADED ZINC OXIDES
ZINC CARBONATE
GERMANIUM DIOXIDE
AGRICULTURAL LIMESTONE
CRUSHED STONE

Distributors for

American Zinc sales Company

AMERICAN ZINC, LEAD & SMELTING COMPANY

Columbus, Ohio • Chicago • St. Louis • New York • Detroit • Pittsburgh

Circle No. 8 on Reader Service Card

SUPERIOR CASTINGS, EXTRUSIONS, TRACED TO USE OF ACHESON COLLOIDAL GRAPHITE

The excellent lubricating properties of these materials have been proven under the severe conditions attendant to aluminum permanent molding and extruding. In the specific examples described below, smoother surface finishes, longer die life, and more uniform metal flow are chiefly attributed to the application of a 'dag' brand dispersion.

Fewer rejects, consistently higher quality castings are obtained at Paragon Aluminum Corporation by spraying 'Prodag' on their permanent molds as a pre-pour wash.

Better surface finish with Prodag® permanent mold coating is just one of the reasons why Paragon Aluminum Corporation, a Division of Detroit Harvester Company located at Monroe, Michigan, switched to this Acheson product. After four years of experimentation with other mold washes, Paragon chose 'Prodag' — Acheson semi-colloidal graphite in water — and has used it constantly the past seven years. The reasons for its choice are these: uniform consistency, excellent heat-transfer quality, and its hard, smooth, tenacious film which resists flaking and provides easier parting characteristics.

With about 95 per cent of its annual output of more than two million pounds of castings going to the automotive industry, Paragon must insist upon quality. 'Prodag' helps to maintain this standard. Parts for convertible automobile tops are precision-molded from both 355 and 319 aluminum alloy. Molds are pre-heated before each day's run to 600° F. and the casting cycle maintains this temperature. The 'Prodag' dilution ratio is 1 to 4 parts water and is applied to the molds with a commercial spray gun. Aside from occasional touchup at points of greatest wear, this coating lasts through the entire run. Because of the physical contours involved in these comparatively small, light castings, they require rapid cooling in certain areas to insure uniform strength. The 'Prodag' coating — with its proven fast heat transfer ability — allows the castings to cool without breaks or pinholes. And by parting more easily, the high-finish castings which result have given Paragon Aluminum products wide acceptance in this demanding industry. If you have a metal casting problem, write direct for additional information contained in our Bulletin No. 425. Address Dept. PMM-30.

'dag', 'Aquadag', and 'Prodag' are trademarks registered in the U.S. Patent Office by Acheson Industries, Inc.

FASTER APPLICATION, LESS MATERIAL USED IN THIS EXTRUSION APPLICATION

Aluminum Extrusions, Incorporated, of Charlotte, Michigan, has realized a 30% savings in their material handling costs by the use of Aquadag® — Acheson colloidal graphite in water. They formerly had used an oil-graphite mixture which required a dilution ratio of 16 lbs. of graphite to a 55 gallon drum of oil. It was too slowly applied by swab and too coarse to effectively apply by spray.

With 'Aquadag', Aluminum Extrusions has a lubricant that is finer in particle size, permits wider coverage, and provides greater "sprayability". These minute particles pass freely through the spray nozzle, eliminating the costly downtime formerly involved in cleaning clogged equipment. The tough, dry film 'Aquadag' forms upon the evaporation of its water carrier, doesn't smoke or react when applied to hot dies and metals. This improves working conditions as well as extends die life. Important also to both die surfaces as well as the finished extrusion, is the fact that this durable, low-friction film allows easier, more uniform metal flow.

Acheson 'Aquadag', applied on die surfaces provides faster, more uniform application for Aluminum Extrusions, Incorporated.

If your problem is more effective lubrication under normally adverse conditions of extreme temperature, pressures, or abrasions, call in Acheson. In the meantime, write for your free copy of Bulletin No. 426.

ACHESON

dispersions digest reporting uses for

dag® BRAND DISPERSIONS

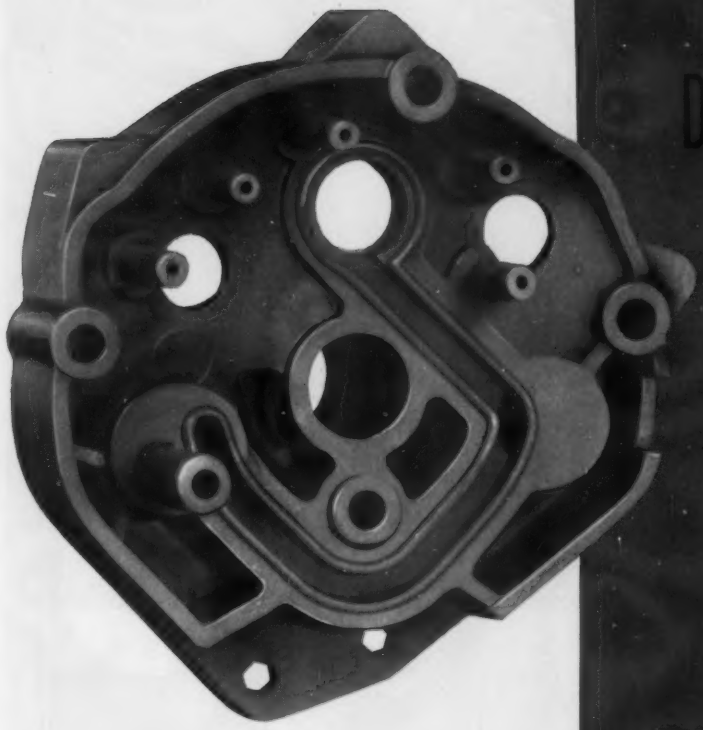
ACHESON *Colloids Company* **PORT HURON, MICHIGAN**

A division of Acheson Industries, Inc. Also Acheson Industries (Europe) Ltd. and affiliates, London, England

Offices In:

Boston • Chicago • Cleveland • Dayton • Detroit • Los Angeles • New York • Philadelphia • Pittsburgh • Rochester • St. Louis

Circle No. 3 on Reader Service Card



Designing Excess Labor Out of your product with MADISON-KIPP zinc and aluminum die castings

In the DOLE VALVE COMPANY'S AUTOMOTIVE VACUUM SERVO CONTROL HEAD the intricate shape, the tubes, the gasket grooves and holes are all cast to size.

This is a prime example of maximum utilization of the die casting process.

The skilled and cost-conscious mechanics at Madison-Kipp worked closely with the valve designer to create a component of excellence and low secondary labor content.

Please clip this ad as a reminder to contact us when you have die casting requirements.

MADISON-KIPP CORPORATION
213 WAUBESA STREET • MADISON 10, WISCONSIN U.S.A.

- **Skilled in Die Casting Mechanics**
- **Experienced in Lubrication Engineering**
- **Originators of Really High Speed Air Tools**

kipp

Circle No. 36 on Reader Service Card

Press the button, that's all! The Ajax Magnethermic Billet Heater delivers a billet at exact temperature to the extrusion or forging press.

THE NEW NAME WITH THE FAMILIAR RING!

60 Cycle Induction Billet Heaters manufactured by AM... one of our many products for induction heating or melting of all types of metals.

"induction heating is our only business"

Ajax Magnethermic CORPORATION

GENERAL OFFICES
P. O. BOX 839
Youngstown 1, Ohio

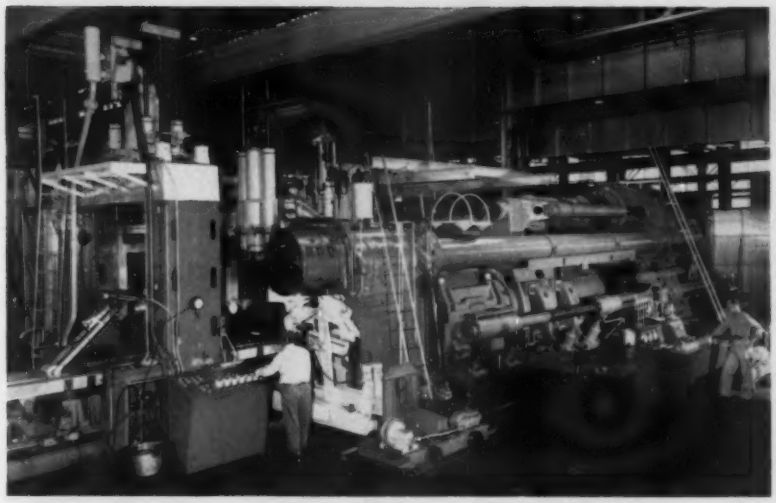
TRENTON DIVISION
930 Lower Ferry Road
Trenton 5, New Jersey

YOUNGSTOWN DIVISION
3990 Simon Road
Youngstown 1, Ohio

Circle No. 4 on Reader Service Card

NEWS OF INDUSTRY & ASSOCIATIONS

activities of people, companies & groups in the precision metal molding industries



SECOND GIANT EXTRUSION PRESS AT ALCOA PLANT OPENS DOOR TO CIVILIAN USES

Aluminum Co. of America has installed a 14,000 ton extrusion press in its Lafayette, Ind. works. This is the second press of this size to be installed in this plant.

The new press can extrude extreme lengths, with widths up to 39 inches, and weighing up to 2500 pounds. The companion press is operated by Alcoa for the Air Force so that only very limited civilian production was possible. Such industries as transportation, architectural, marine, building products, electrical, chemical, and chemical processing should find products from the new press valuable by furnishing single, high strength sections which had to be made of bits and pieces before.

ALCOA AND G.M. IN HOT METAL DEAL

Just before going to press PRECISION METAL MOLDING was able to confirm industry rumors that a hot metal contract had been signed between the Aluminum Co. of America and General Motors Corp. The metal will be produced at the Warrick reduction plant near Evansville, Ind. and transported to GM's Bedford, Ind. casting plant.

The distance between the two plants is reported as over 100 miles and the trip is expected to take about 4½ hours.

No figures have been released yet on tonnages involved nor the length of the contract.

INVESTMENT CASTING SALES HIT NEW HIGH

As recently as 1957, sales of the investment casting industry were about 90% to defense industries. Today that picture has changed drastically.

Joseph H. Cadieux, president of Casting Engineers, says that sales of investment castings to non-defense industries should reach $17 million in 1960. He went on to say, "Today, however, this trend (sales mostly to defense industries) has changed markedly even though such castings are still used in both manned aircraft and missiles.

"Manufacturers of electronic equipment, machinery of all types, firearms, plus a vast number of consumer end-use product industries are accounting for a massive demand for investment castings."

BRUSH BERYLLIUM ELECTS NEW OFFICERS

The board of directors of The Brush Beryllium Co. has announced the election of Bengt R. F. Kjellgren as chairman of the board and George S. Mikhalapov as president. Kjellgren has been president of the company since 1948 and will continue to be chief executive officer. Mikhalapov has been executive vice president since he joined the company in 1957.

Kjellgren graduated in chemical engineering from the Royal Institute of Technology in Sweden. He came to the United States in 1923 and joined the Brush Laboratories as chief chemical enginer in 1924. With the formation of the Brush Beryllium Co. in 1931 he became a director and vice president.

Mikhalapov was born in Russia. He graduated from M.I.T. in 1926 with a degree in electrical engineering. He has been associated with Stone and Webster, Air Reduction Corp., General Electric, and Coast Metals, Inc.

KJELLGREN

MIKHALAPOV

LARGEST DIE CASTING MACHINE EXPORTED

An 850 ton, hot chamber die casting machine was recently shipped to the Showa Die Cast Co., Tokyo. This is thought to be the largest machine of its kind ever exported from the United States. Manufacturer of the machine was The Cleveland Automatic Machine Co.

While the machine is rated as an 850 ton unit, strain gauge testing showed a locking pressure as high as 920 tons. The shot capacity is 47½ pounds of zinc.

continued on page 72

My answer for fire-resistant fluids is... UCON Hydrolubes

Q. WHY DO YOU NEED A FIRE-RESISTANT FLUID?

Hydraulic line failures never give warning! Without safety-fluids—you can have a disastrous fire. Even if insurance adequately covers the physical loss of buildings and equipment, even if you carry business interruption insurance . . . a fire can put you out of business or so cripple you that an entirely new start with new customers will have to be made.

But more important, a fire, especially one where burning oil is spraying around a building, can mean serious injury to your personnel. *It's a risk that an employer cannot afford to take.*

• UCON hydrolubes are the economical answer to fire-resistance in hydraulic fluids. Extensive field tests and more than 10 years of routine use in industrial hydraulic equipment have proven the safety and economy of UCON hydrolubes. And, UCON hydrolubes are approved for use by Factory Mutual Laboratories.

• UCON hydrolubes have outstanding anti-corrosion and anti-wear characteristics. Thus, pump replacement costs are held to a minimum.

• Conversion to fire-resistant UCON hydrolubes is quick and easy. Standard flushing and refilling procedures, involving a minimum of time and effort are sufficient.

• And once installed, UCON hydrolubes have low loss.

Remember—UCON hydrolubes are the economical answer for fire-resistance in hydraulic fluids. Replacement is quick and easy, and losses are low.

Get all the facts on UCON hydrolubes in the booklet, "UCON Hydrolubes Spell Safety." For a copy, ask a CARBIDE Technical Representative; or write Union Carbide Chemicals Company, Room 328, Department J1, 30 East 42nd Street, New York 17, N. Y.

UNION CARBIDE and UCON are registered trade marks of Union Carbide Corporation.

UNION CARBIDE CHEMICALS COMPANY

UNION CARBIDE

Circle No. 73 on Reader Service Card

H-13 tool steel was used by Dollin Corp., Irvington, N. J., in die casting this aluminum motor housing. The die provided long service, and good resistance to heat checking and wash.

For Die Casting at 1200F to 1300F Team Up with H-13 Tool Steel

Because of its high vanadium content, AISI H-13 tool steel is a natural for die casting aluminum- and magnesium-base alloys in the 1200F-1300F range.

• Bethlehem's grade of H-13—Cromo-High V—has distinct advantages for this type of service. It has good machinability, because it is furnished in the annealed condition to Brinell 207. It has excellent resistance to the formation of a fine network pattern of heat checking. In heat-treatment, Cromo-High V develops uniform hardness, which gives it the ability to resist wash and erosion.

TYPICAL ANALYSIS

Carbon 0.40 Chromium 5.25 Vanadium 1.05
Molybdenum 1.25 Silicon 1.00

Your Bethlehem tool steel distributor will be pleased to provide full information about Cromo-High V, or any of our other die casting die steels. Get in touch with him.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Circle No. 79 on Reader Service Card

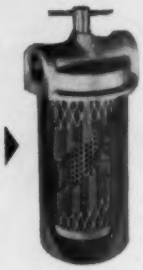
MARVEL
SYNCLINAL FILTERS

FOR DEPENDABLE PROTECTION on all Hydraulic and other low pressure circulating systems

Designed to give more ACTIVE filtering area—MORE dependable protection—MORE productive operation before cleaning is necessary. *Meet J.I.C. Standards.*

Synclinal SUMP TYPE

CAPACITIES: 5—8—10—20—30—50—75 and 100 G.P.M.
PIPE SIZES: ¾"—1"—1¼"—1½"—2"—2½" and 3".
CONNECTIONS: Coupling—Male Nipple.
BY-PASS VALVE: Not Available.



Synclinal LINE TYPE

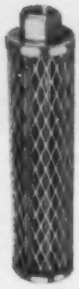
CAPACITIES: 5—8—10—20—30—50—75 and 100 G.P.M.
PIPE SIZES: ¾"—1"—1¼"—1½"—2"—2½" and 3".
BY-PASS VALVE: Not available.
OPERATING PRESSURES: Up to 80 p.s.i.

Bonded SUMP TYPE

CAPACITIES: 10—20—30—50 and 75 G.P.M.
PIPE SIZES: 1"—1¼"—1½"—2"—and 2½".
CONNECTIONS: Coupling—"O" Ring—Male Nipple.
BY-PASS VALVE: Available with or without

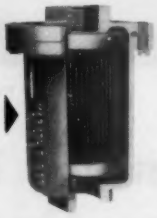
Bonded LINE TYPE

CAPACITIES: 10—20—30—50 and 75 G.P.M.
PIPE SIZES: 1"—1¼"—1½"—2" and 2½".
BY-PASS VALVE: Available with or without.
OPERATING PRESSURE: Up to 250 p.s.i.
OPERATING TEMPERATURES up to 300° F.



Tandem SUMP TYPE

CAPACITIES: 10—16—20—40—60—100—150 and 200 G.P.M.
PIPE SIZES: ¾"—1"—1¼"—1½"—2"—2½" and 3".
CONNECTIONS: Coupling—Male Nipple.
BY-PASS VALVE: Not available.



IN-LINE FILTER

CAPACITIES: Up to 60 G.P.M.
PIPE SIZES: ¾"—1"—1¼" and 1½" (at both inlet and outlet).
BY-PASS VALVE: Available with or without

FILTERING MEDIA in all Marvel Filters is Monel wire cloth available in mesh sizes of 30-40-50-60-80-100-150 and 200 to meet your filtration requirement.
EASY TO CLEAN—All Marvel Filters are easy to clean. Line type units operate in any position and may be serviced without disturbing pipe connections.
OVER 900 O. E. M's. install Marvel Filters as Standard Equipment.

IMMEDIATE DELIVERY

For further information on a specific type filter—Write—wire or phone

MARVEL ENGINEERING COMPANY
7227 N. Hamlin Ave., Chicago 45, Ill.
Phone: JUniper 8-6023

Please send me information on Marvel Filters as indicated: PMM-3

☐ Hydraulic Oils ☐ Coolants ☐ Lubricants ☐ Fire Resistant Fluids
☐ Water ☐ Sump Type ☐ Line Type ☐ In-Line

Name_____
Company_____
Address_____
City_____ State_____

PMM LETTERS

the readers' forum

DESIGN MANUAL IS GROUP EFFORT

We were pleased to note that your January issue carried an article on the new investment casting book "How to Design and Buy Investment Castings."

"How to Design and Buy Investment Castings" is the result of a cooperative effort on the part of the investment casting industry to present the facts of this new metal-forming process in the manner that will be helpful to designers as well as production and procurement executives.

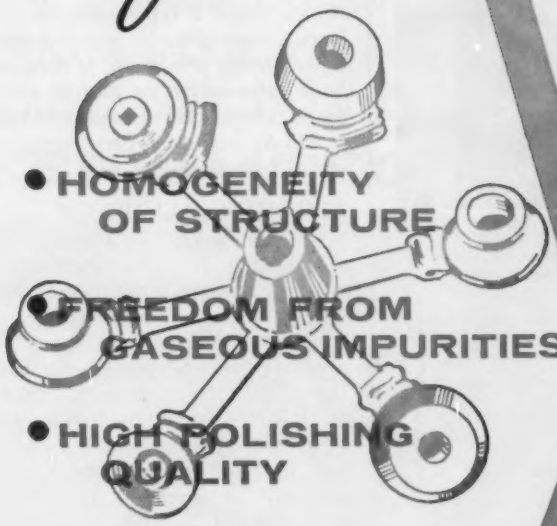
Unfortunately your article tends to leave the impression that the book is primarily the work of one individual. On the contrary, it is the work of many men, who have worked individually and on committees to complete sections of the comprehensive data presented in our new publication. As a matter of fact, those who read the book will see that it contains the following acknowledgment:

> "This manual is a group effort. It is a summation of the experience and knowledge of many men in the investment casting industry. The Investment Casting Institute, in acknowledging the work of these men, expresses its gratitude to them and to the sponsoring member companies of the Institute for making this manual possible."

May we also point out that your article did not mention that "How to Design and Buy Investment Castings" may be purchased from the Investment Casting Institute, 27 East Monroe, Chicago 3, Ill., price $3.95 per copy.—Harry P. Dolan, Executive Director.

continued on page 30

for...



- HOMOGENEITY OF STRUCTURE
- FREEDOM FROM GASEOUS IMPURITIES
- HIGH POLISHING QUALITY
- RESISTANCE TO THERMAL AND MECHANICAL FATIGUE

Vacuum Degassed

THERMOLD® AV

DIE CASTING DIE STEEL

Thermold AV—the superior die casting die steel, assures you of highest quality by the use of a modern melting technique—*vacuum degassing*. For the first time in the United States, Universal-Cyclops has produced large size ingots of vacuum degassed Thermold AV in standard production processing.

Thermold AV—the ultimate in die casting die steels features homogeneity of structure, freedom from gaseous impurities, higher polishing qualities, and resistance to thermal and mechanical fatigue.

Thermold AV—is hot worked on a 2,000 ton fast-acting press to assure improved center structures. In addition, Thermold AV is subject to quality controls which have set the standard for the industry: small batch furnace melting, close control of press forging and annealing, and 100% Reflectoscope testing.

Thermold AV is supplied in all sizes to meet your requirements. For complete information, call or write your nearest Universal-Cyclops sales office or warehouse today.

UNIVERSAL CYCLOPS
UC STEEL
STEEL CORPORATION
BRIDGEVILLE, PA.

SALES OFFICES AND WAREHOUSES

BUFFALO	DETROIT	MILWAUKEE	ST. LOUIS
CHICAGO	HARTFORD	NEW YORK	SYRACUSE
CLEVELAND	INDIANAPOLIS	PHILADELPHIA	WASHINGTON, D.C.
DAYTON	LOS ANGELES	PITTSBURGH	WORCESTER

MILLS

BRIDGEVILLE, PA. • TITUSVILLE, PA. • COSHOCTON, OHIO

TOOL STEELS • STAINLESS STEELS • HIGH TEMPERATURE METALS

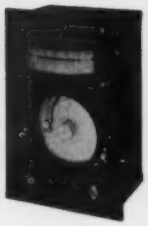
Circle No. 77 on Reader Service Card

SPECIFIED
FOR MAKING SEMI-CONDUCTORS

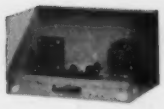
Part of diffusion furnace room, Hoffman Electronics Corporation, El Monte, California. Process is one step in critical manufacture of silicon solar cells.

Gardsman by WEST

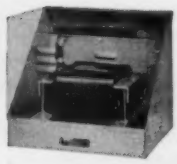
Model JSBG Stepless Program Controllers



Semi-conductors are grown by a highly integrated process, involving time-temperature control. Only the most precise control delivers the required quality, uniformity, efficiency.



Leading producers of semi-conductors find best results from the market's most compact, integrated Stepless Program Controller: by West. This unit infinitely modulates heater power *and* coordinates time-and-temperature control for even the most unstable systems.



Also available: models combining Gardsman off-on, proportioning or 3-position controllers with programming. All are *tubeless* and noted for minimum maintenance and operating requirements. Ask your West representative or write for Bulletin JSB and JG.

See us at the 29th National Packaging Exposition Atlantic City, New Jersey Convention Hall April 4-7, 1960 Booth 1220

WEST Instrument CORPORATION
SALES OFFICES IN PRINCIPAL CITIES

4357D W. MONTROSE, CHICAGO 41, ILL.

British Subsidiary:
WEST INSTRUMENT LTD.,
52 Regent St., Brighton 1, Sussex
Represented in Canada by Davis Automatic Controls, Ltd

the trend is to WEST

Circle No. 50 on Reader Service Card

LETTERS

continued from page 28

PMM's thanks to Mr. Dolan for allaying possible misinterpretation of our report on the new ICI design and purchasing book. This handy reference book actually is the work of a large group of members of the Investment Casting Institute. Since it represents the collective experience of many investment casting producers, it contains basic information on design, tolerances, alloys, and related data that would be useful in every engineering and buying office.—Ed.

ANODIZING ALUMINUM

Can you send me a reprint of any article that has been published in your magazine regarding anodizing of aluminum die castings. I am particularly interested in the type of alloy and the kind of machines that the castings are made in. I am most interested in the light color anodizing such as gold, and any information which you can send me would be greatly appreciated. — J. A. McV.

We have sent this reader as much material as we have. Most of the successful gold anodizing of aluminum which has been done so far has been on high purity aluminum (very low in or free of silicon) with casting done under reduced air pressure. Yoder Die Casting Co. has been making emblems and name insignia for Pontiac and there are a few other applications. Also, several of the prime producers of aluminum have active programs going on to develop an anodizable and die castable alloy. No positive results have been reported yet, but we understand that some success has been achieved. — Ed.

METAL IDENTIFIER

We read in your Spetember, 1959 issue of Heatcheck, manufactured by Metrol, Inc. We would appreciate your advising the manufacturer as to our interest in this item. — S. S. pres.

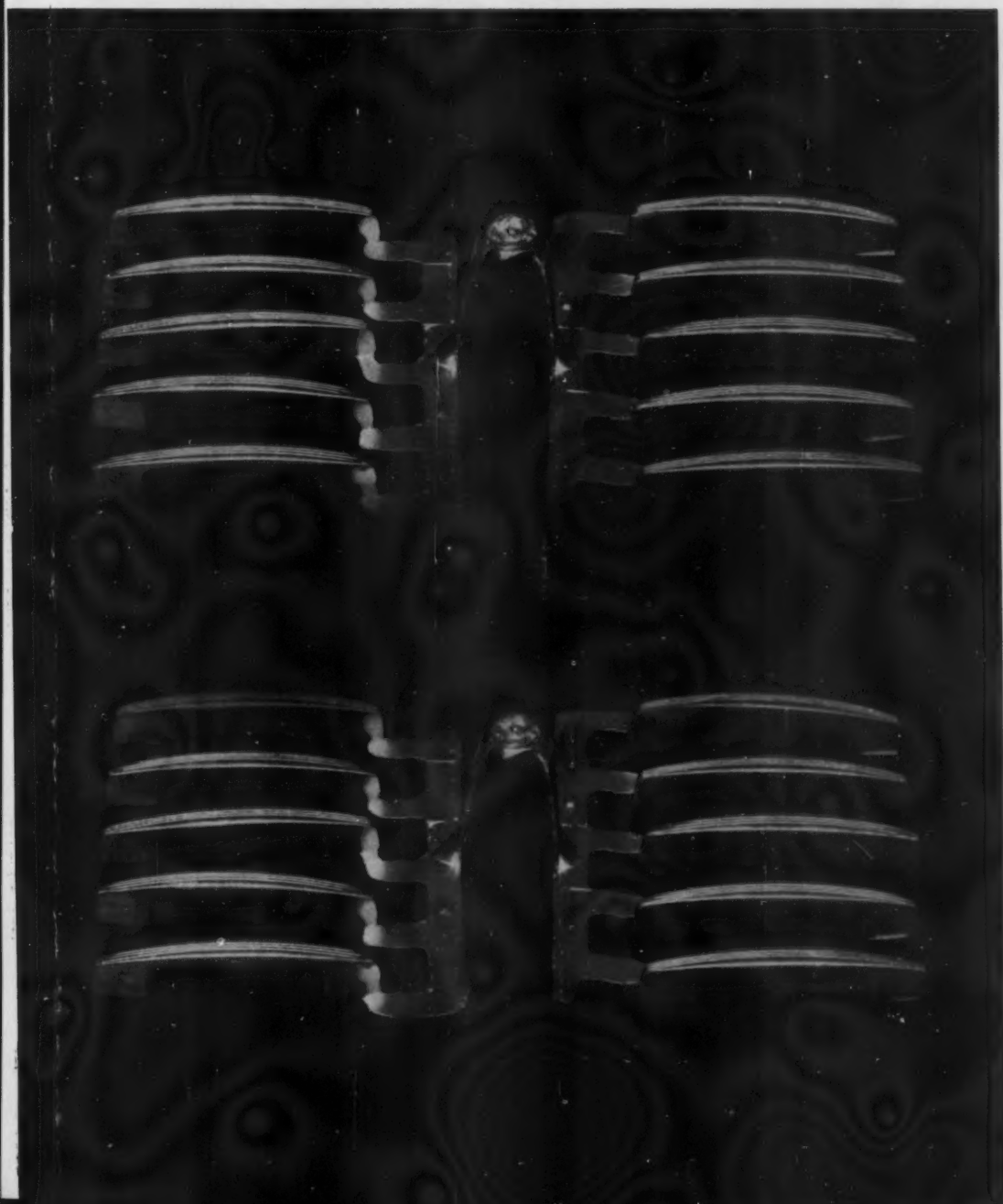
Heatcheck is the name of an instrument used to identify many metals and alloys by their conductivity or permeability. It is manufactured by Metrol, Inc., 17 E. Holly, Pasadena, Calif. — Ed.

continued on page 70

Circle No. 74 on Reader Service Card

Completely controlled production provides you with die cast metals of highest purity and uniformity. Federated Di-Metal is made from special high grade zinc, electrolytically refined by Asarco-developed processes. Production is now concentrated "under one roof" at Corpus Christi, Texas, one of the world's largest plants producing special high grade zinc. Integrated production—controlled from mine to finished alloy—assures you of lower cost Zinc Di-Metal of the highest purity and uniformity. Federated can serve your Di-Metal needs through 22 sales offices throughout the country. There's one near you. Federated Metals Division, 120 Broadway, New York 5. In Canada: Federated Metals Canada, Ltd., Toronto and Montreal.

FEDERATED METALS DIVISION OF



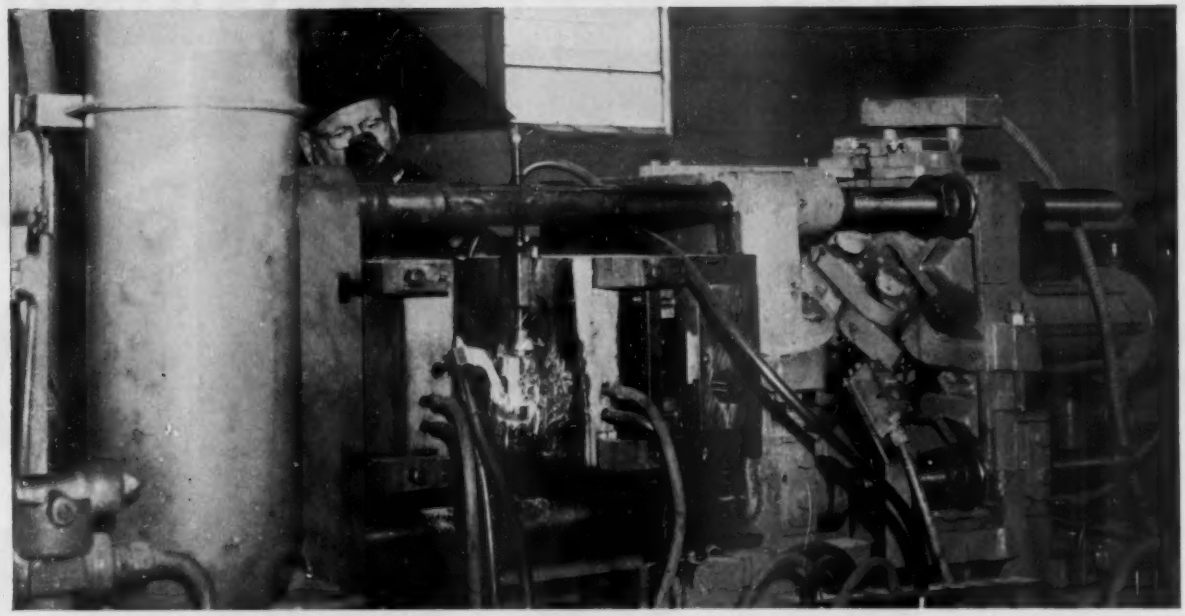
ASARCO

AMERICAN SMELTING AND REFINING COMPANY

SAVE ON SHORT RUN DIE CASTINGS!

CHANGE DIES IN MINUTES!

With D-M-E Standard Unit Dies for Zinc or Aluminum Die Casting



Cut Die Costs and Save Time with Stock Replacement Units

DIE CHANGES that normally take 3 to 5 hours are done in minutes with D-M-E's Standard Unit Dies for zinc or aluminum die casting.

Standard interchangeable Replacement Units are *in stock* now to reduce your die costs and shorten delivery schedules.

D-M-E's Standard Unit Die assembly offers these unique features for added savings in production time and maintenance:

Construction permits complete freedom on *three sides* of the cavity for placement of cores or cooling lines; six sturdy leader pins and bushings provide accurate alignment and trouble-free performance; and "quick change" wedge clamps for positive positioning of each plate.

Standard Replacement Units are quickly positioned in the Unit Die Holder by a precision T-slot in the mating edge of the plates; there is no interference with the cavity layout.

Whether you require rack and pinion or automatic "bumper-type" ejection, D-M-E has a Standard Unit Die to fit the machine.

D-M-E Unit Die Holders are available for Standard 10" x 12" or 12" x 15" Replacement Units.

Start saving *now* on your short-run die-casting jobs with D-M-E Standard Unit Dies.

SEVEN BRANCHES FOR FASTER SERVICE

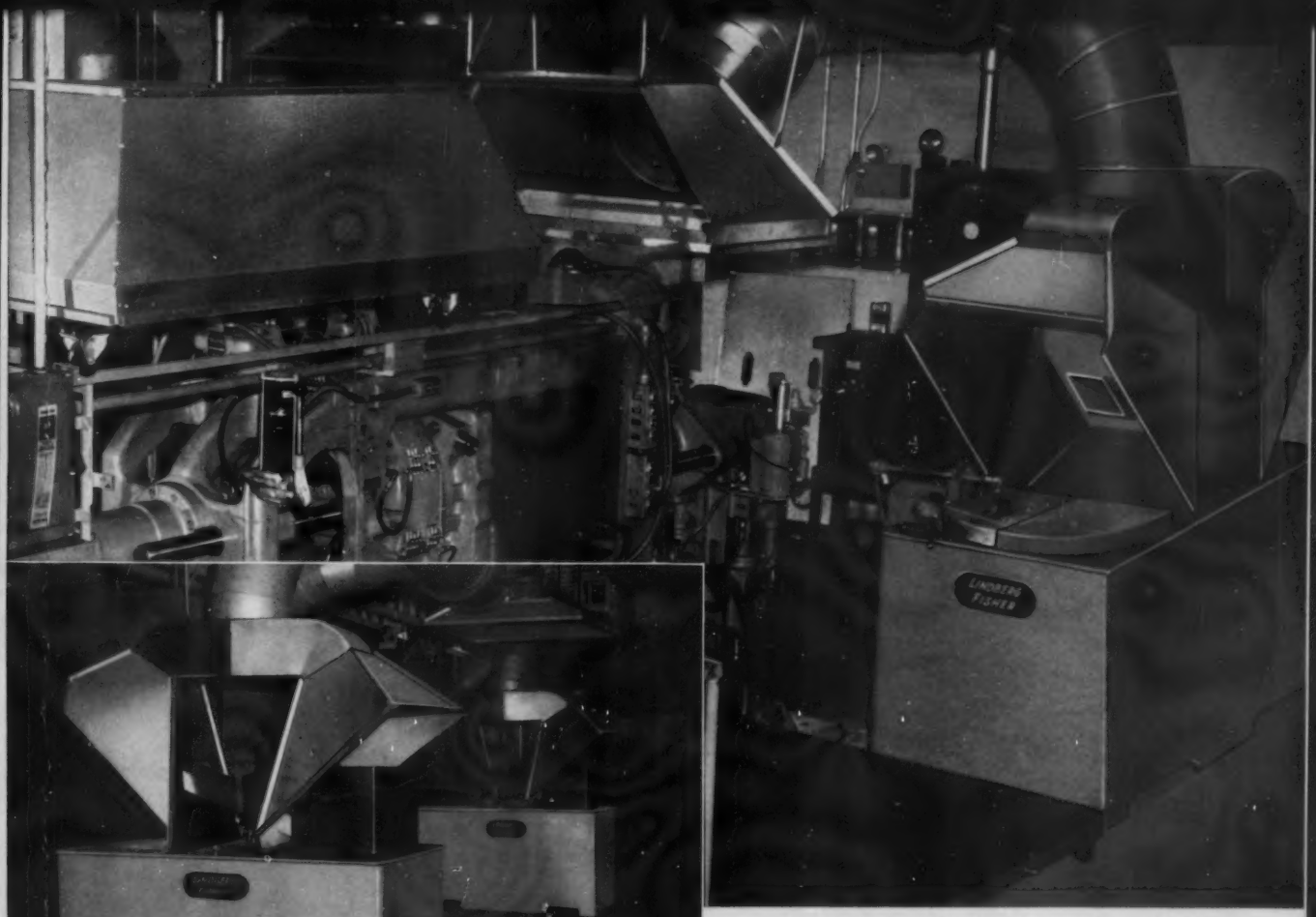
Write **TODAY** for Complete Specifications

DETROIT MOLD ENGINEERING COMPANY

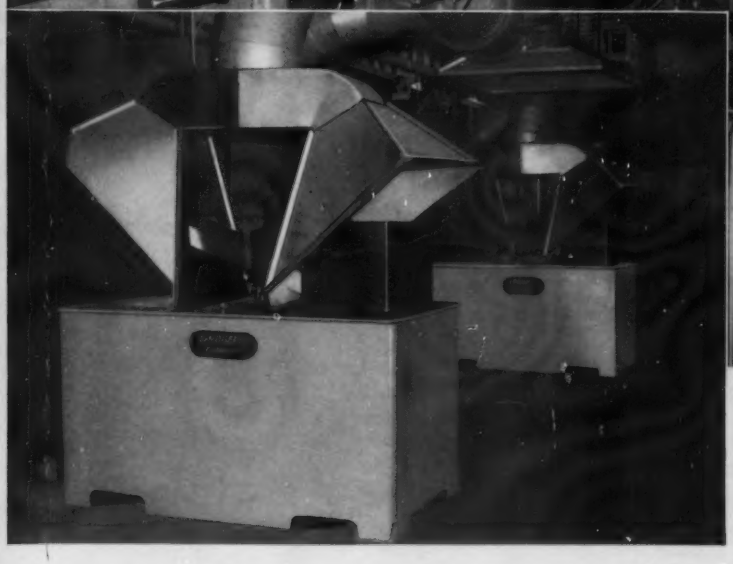
DME

- DETROIT: 6686 E. McNichols Rd.—CHICAGO: 5901 W. Division St. HILLSIDE, N.J.: 1217 Central Ave.—LOS ANGELES: 3700 S. Main St.
- D-M-E CORP., CLEVELAND: 502 Brookpark Rd.—DAYTON: 558 Leo St.
- D-M-E of CANADA, Inc., TORONTO, ONT.: 156 Norseman Ave.

Circle No. 20 on Reader Service Card



Lindberg Melting and Holding Furnaces at Electrolux Corporation, Old Greenwich, Conn., are conveniently spotted adjacent to die casting machines. Special furnace hoods remove accumulated gases.



Lindberg battery at Electrolux. These 80 KW two-chamber induction furnaces melt and hold aluminum for die casting Electrolux Vacuum Cleaner parts. Note convenient chute to return gates and risers to melting chamber with splash shield.

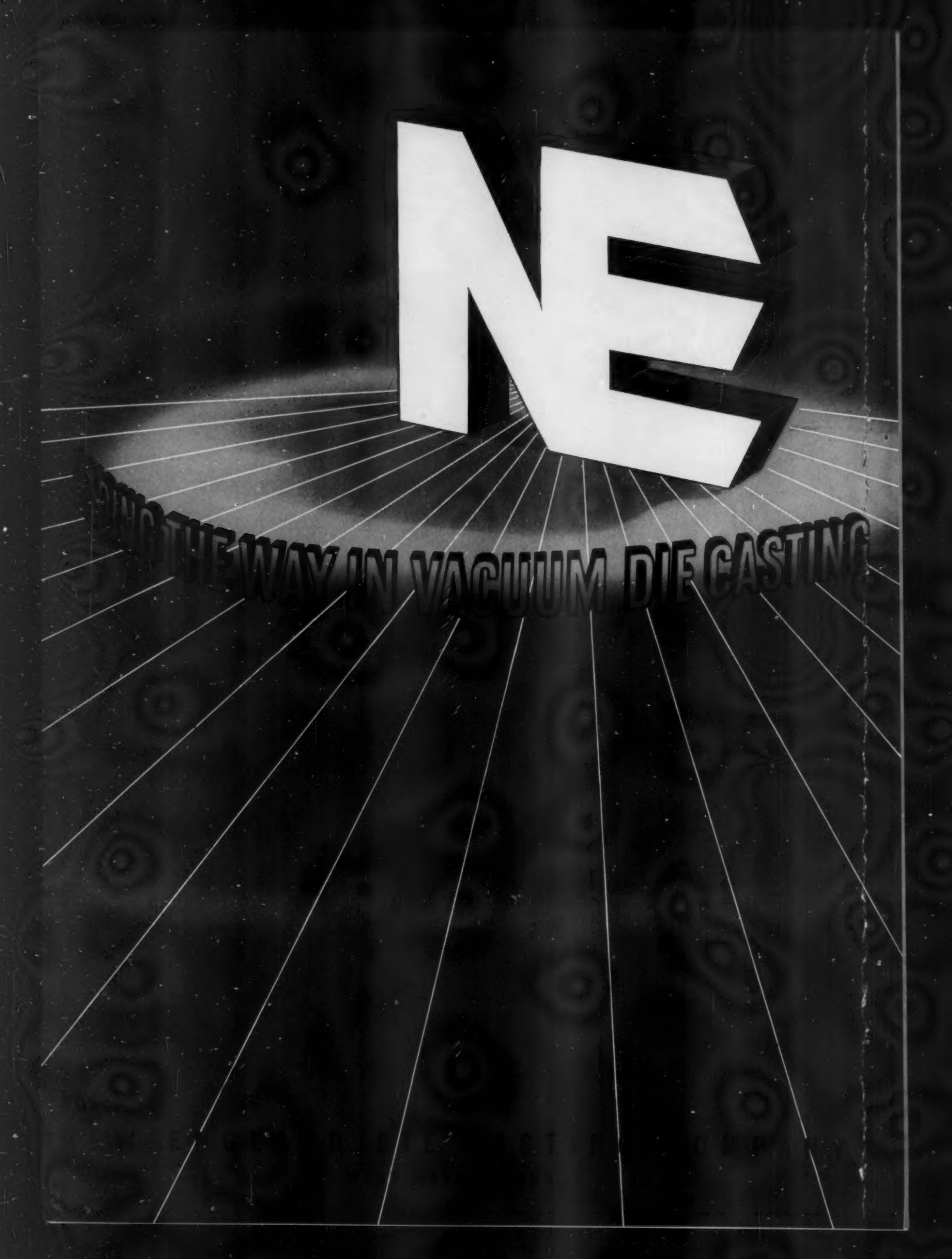
LINDBERG MELT AND HOLD FURNACES HELP DIE CASTING EFFICIENCY AT ELECTROLUX

Recently, Electrolux Corporation, Old Greenwich, Conn., decided to die cast parts for the famous Electrolux Vacuum Cleaner in their own plant. To insure greatest efficiency and to provide the most ideal layout and working conditions Lindberg Two-Chamber Induction Melting and Holding Furnaces were selected to supply aluminum for the die casting machines. Electrolux has found Lindberg equipment to be completely reliable, ideal casting temperatures are easily maintained and the absence of noise and burner heat assures comfortable clean working areas. Operation has proved so satisfactory that two additional Lindberg furnaces have been purchased and are now being installed.

Wherever or however aluminum needs heat there is Lindberg equipment to apply it most economically and efficiently. Furnaces for melting and holding, casting stations, remelting or heat treating are available in all capacities, electric or fuel fired. See your Lindberg Field Representative (consult your classified phone directory) or write us direct. Lindberg-Fisher Division, Lindberg Engineering Company, 2463 West Hubbard Street, Chicago 12, Illinois. Los Angeles Plant: 11937 S. Regentview Ave., Downey, Calif. In Canada: Birlefco-Lindberg, Ltd., Toronto. *Also factories in:* Argentina, Australia, England, France, Germany, Italy, Japan, Scotland, South Africa, Spain and Switzerland.

Circle No. 92 on Reader Service Card

LINDBERG heat for industry


NE
THE WAY IN VACUUM DIE CASTING

The growth in the use of

ALUMINUM IN THE AUTOMOBILE ENGINE: 1899 TO 1960

THE USE OF ALUMINUM in structural engine parts is a post war development. Post Spanish American war, that is. The Berg automobile, built in this country during 1899 and 1900, boasted a cast aluminum crank case and cast aluminum oil pans.

Since that time, there has been a fairly steady progress in the wider use of aluminum for both structural, decorative, and housing parts on both American and European automobiles.

In the United States this progress has culminated, as of the present, in Chevrolet's compact car, the Corvair. While the early cars generally had less than 10 lbs. of metallic aluminum parts, this newest member of the family carries over 102 lbs. of metallic aluminum.

Unquestionably, the Corvair is not the end. Larger, water-cooled engines with die cast blocks, heads and other functional parts are coming. Considerable is already known about these engines, but this material can not be released yet.

Excepting pistons, all of the early aluminum castings used on automobiles were sand castings. At first they were in the old 112 alloy. Later, about 1912, an improved alloy, no. 122, was used (this was the first piston alloy). About the same time alloy no. 142, also known as Magnalite, was introduced as a piston alloy. The next improvement was alloy no. 145 (now no. 645) and finally alloy no. 195. (Note: Aluminum Co. of America numbers are used since some of the early alloys had no corresponding ASTM designations). The approximate composition of these alloys is given in Table I.

During the development period for automobiles in this country, aluminum castings were widely used in non-structural parts and on many early cars the crank case was also aluminum.

About 1904 the "Royal Tourist" was produced. It featured cast-in bronze main bearings in the aluminum crank case. This car also had a cast aluminum transmission case and cover.

During this period, America's first luxury car was in production. The Locomobile was built to be the finest car which could be produced, without regard for cost. It had a number of cast aluminum parts, all of them non-structural. A 1909 model chassis is shown on page 36.

TABLE I – APPROXIMATE COMPOSITION OF ALUMINUM CASTING ALLOYS

Alloy	Year	Cu	Fe	Mg	Zn	Ni	Al
[illegible]	1900	7.5	1.2		1.5		Bal.
[illegible]22	1912	10.0	1.2	0.2			Bal.
[illegible]42	1912	4.0		1.5		2.0	Bal.
[illegible]95 [illegible]6481	1930	2.5	1.5		11.0		Bal.
[illegible]95	1935	4.0					Bal.

Data courtesy · Mignon Van Treuren, Alcoa Research Labs., Cleveland, Ohio.

Nearly all of the cars produced prior to World War I used some cast aluminum parts. The cast piston was introduced in 1912 and during the war all of the Liberty engines built had aluminum pistons, which were all permanent mold cast.

About 1918 the first aluminum production engines were built. Both Marmon and Premier came out with them. The Premier was probably the first really all aluminum engine since the Marmon used a cast iron cylinder head, and the pistons were a block of aluminum bolted to a cast iron skirt. Premier, however, used a cast aluminum head and cast aluminum pistons. Both engines had steel cylinder liners pressed into the cast block. These liners were dry-cooling water circulated against the aluminum.

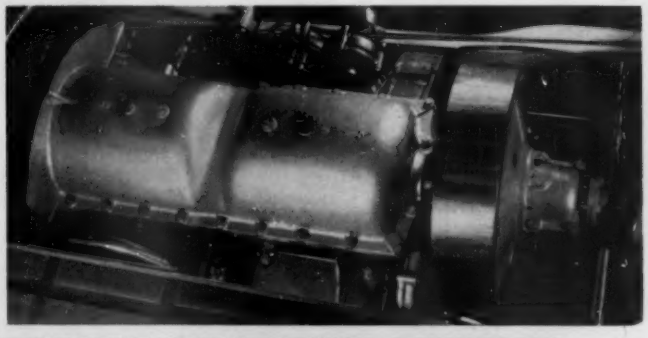
Another early all aluminum engine was the Pomeroy, page 37. This car was produced to make the widest possible use of aluminum. Body, chassis, and engine used major amounts of aluminum. The car had a wheel base of 135 inches and a 254 cu. in., six cylinder engine. Through the use of aluminum 1051 lbs. dead weight were saved, which was about 1/3 the weight of the equivalent car made in steel.

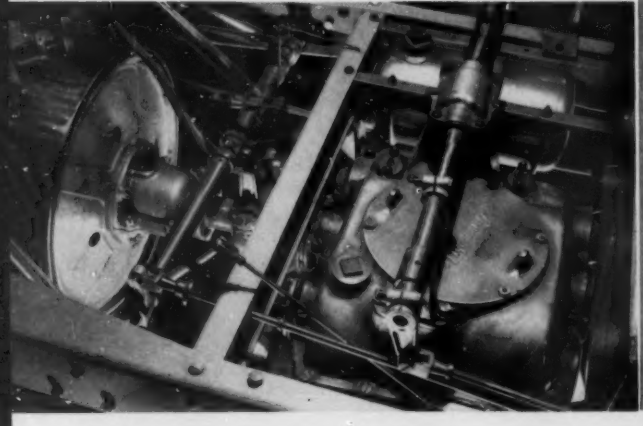
Several other experimental cars were built after the Pomeroy (only three cars were built by Pomeroy). A Cole was equipped with an experimental all aluminum engine in the early 1920's.

After World War I most manufacturers shifted to cast iron blocks and crank cases. A few, notably Buick, stuck with cast aluminum crank cases until about the middle 1920's.

During this same decade the first, or nearly the first aluminum connecting rods were used. Nash had forged rods about 1925, but didn't use them long.

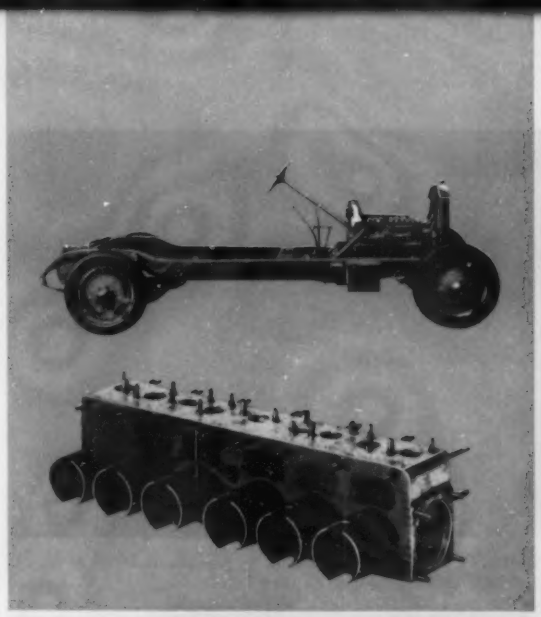
The Franklin, an air-cooled engine, used a cast aluminum crank case for individual cylinders starting about 1922. This engine also had aluminum pistons and connecting rods. About 1930 the switch to a cast aluminum head was made, page 37. With no other major change the brake horse power was increased from 67 to 87 for a 274 cu. in. engine. Franklin engineers claimed that the improvement was due to the better cooling secured with the aluminum head.

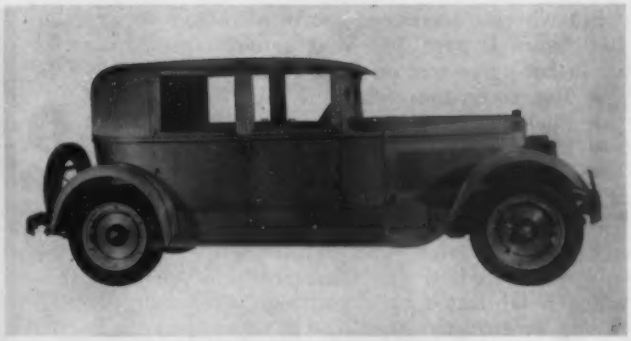




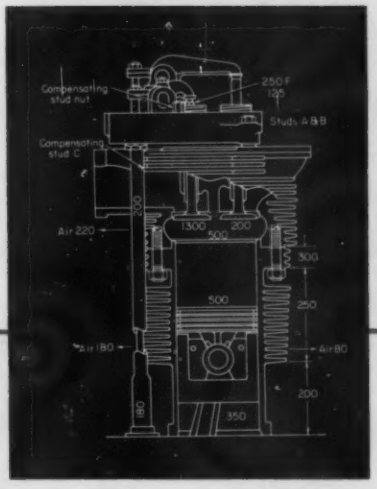
THE LOCOMOBILE, the first real luxury car built in this country. Cost was no object and in addition to lots of aluminum this car had a cast bronze crankcase, hand scraped, full babitted main bearings.

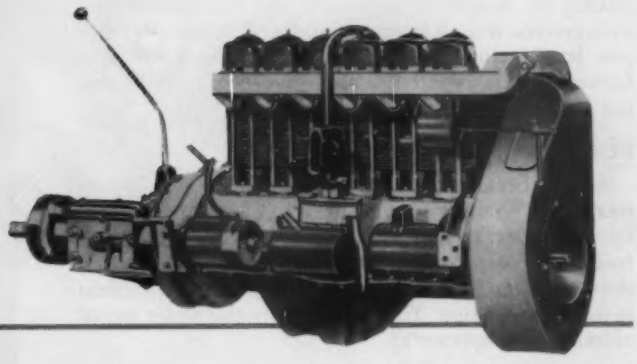
It was said of this car that it was engineered, built and then priced, in that order.





POMEROY built three of these cars to demonstrate the widest possible use of aluminum in automobiles (in 1923). Only one of these cars is known to be left. It's in the Ford museum in Dearborn, Mich.





FRANKLIN used aluminum for its high thermal conductivity. By the simple change from a cast iron cylinder head to a cast aluminum cylinder head, the horse power of the engine was increased by about one-third.

Also in 1930 Marmon came out with a "V" 16 production engine. The cylinders were in two banks at 45°. It had a one-piece aluminum cylinder block with individual wet type sleeves of cast iron. Both cylinder heads and the intake manifold were cast aluminum.

This Marmon engine, page 38, had a displacement of 491 cu. in., developed 200 brake horse power and weighed less than 5 lbs./hp. In addition to the cylinder block, heads, and manifolds, the oil well, crankcase, valve covers, and pump housings were aluminum. This engine was highly satisfactory and a stock sedan won the Stevens Trophy by averaging 74 mph for 24 consecutive hours.

In 1932 Peerless produced three or four all aluminum cars (page 38). Three 16 cylinder engines and one 12 cylinder engine were built. These engines had the cylinder block, heads, intake manifold, bell housings, and transmission case of aluminum castings. The block had Ni-Resist iron cylinder sleeves, forged aluminum connecting rods, and cast aluminum pistons. The engine had a 3¼" bore X 3½" stroke. It developed 173.3 BHP (5½% correction) and at 3300 RPM had a speed of 82.5 miles per hour.

The frame of this car was 51S aluminum sheet. The front axle was an aluminum forging and the rear axle housing an aluminum casting. Brake shoes, brake drums and wheels were all aluminum. The car weighed over 4000 lbs. with a wheel base of 145".

NOW THE CORVAIR

Development of the aluminum engine then lagged in this country until the introduction of the Corvair in 1960. This car has a pancake type air-cooled engine, page 39, rated at 80 HP at 4400 rpm. The six cylinder engine has a 3.38" bore X 2.6" stroke with 140 cu. in. displacement. The aluminum components of this engine are shown on page 40. Total weight of aluminum in the engine is 92 lbs. and for the entire car the total aluminum used weighs 102.6 lbs. (Note that these weights are with a standard transmission. With an automatic transmission the weight of aluminum would be increased.

Die castings, permanent mold castings and extrusions are all used in the Corvair. The simple substitution of aluminum in place of cast iron not only lowers dead weight and gives better cooling, but permits faster, lower-cost machining of the components on the same type of equipment as is used for more conventional engines. (A short description of the machining of Corvair cylinder heads is on page 59, this issue.)

But why the increasing use of aluminum in cars? (see figure 1, page 39) Most automotive engineers are in fair agreement on these points:

- The power-to-weight ratio must be raised.
- Fuel economy must be increased.
- Manufacturing costs must be lowered.
- Design must look to the future as well as at the present.
- Comfort and convenience must be maintained.
- Passenger safety must be increased.

Now let's see how aluminum, particularly aluminum which is fabricated by die casting, permanent mold casting, or extrusion, is helping to do the jobs the engineers say must be done.

POWER-TO-WEIGHT RATIO

Getting a car rolling is one of the greatest fuel consuming factors. Up to about 40 miles per hour, so-called rolling friction takes most of the power. By reducing the weight of the vehicle the fuel requirement to overcome rolling friction is reduced. Above 40 miles per hour, wind resistance becomes the controlling factor and the problem is then one of aerodynamics, not weight.

FUEL ECONOMY

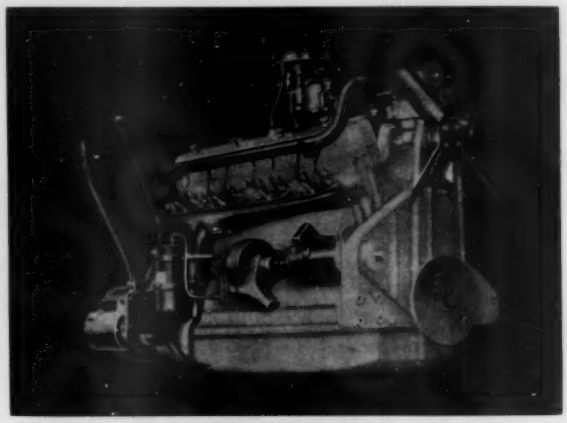
As cars became larger and larger, the weight had to increase. The most obvious answer to continued good operation was to increase the size of the engine. This had to come to an end because the car had to be stopped. The practical way to answer this problem is weight reduction. This is helped by the wider use of aluminum components.

MANUFACTURING COSTS

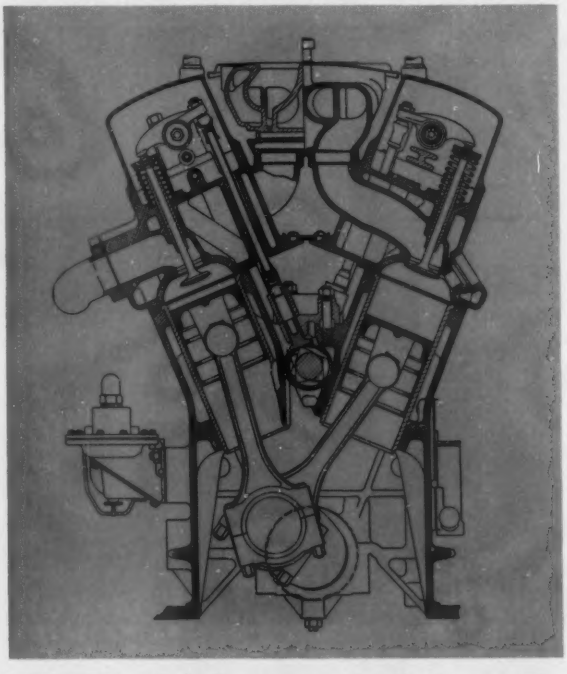
Through the use of die castings, permanent mold castings, and extruded shapes, far more nearly complete components can be cast and more desirable shapes, for either functional or aesthetic reasons, can be made. Further, the fabricating processes will produce these parts at a far higher rate (number of parts per man-hour of labor) than any other fabricating method.

DESIGN

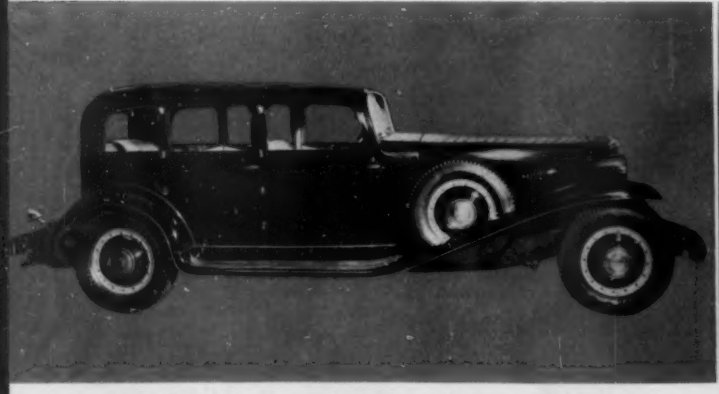
The automobile designer must be able to anticipate the temper of the buying public by at least two years.



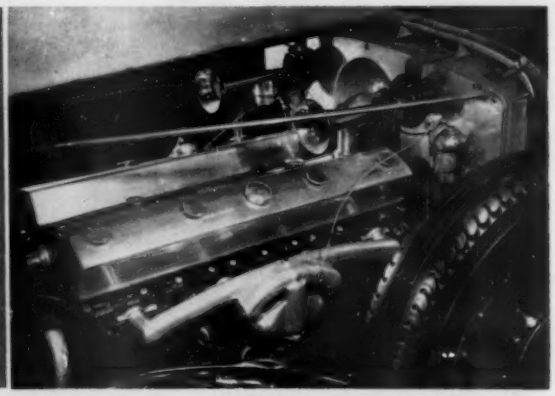
MARMON built this all aluminum engine about 1930. It was a 16 cylinder engine; only a few were built.



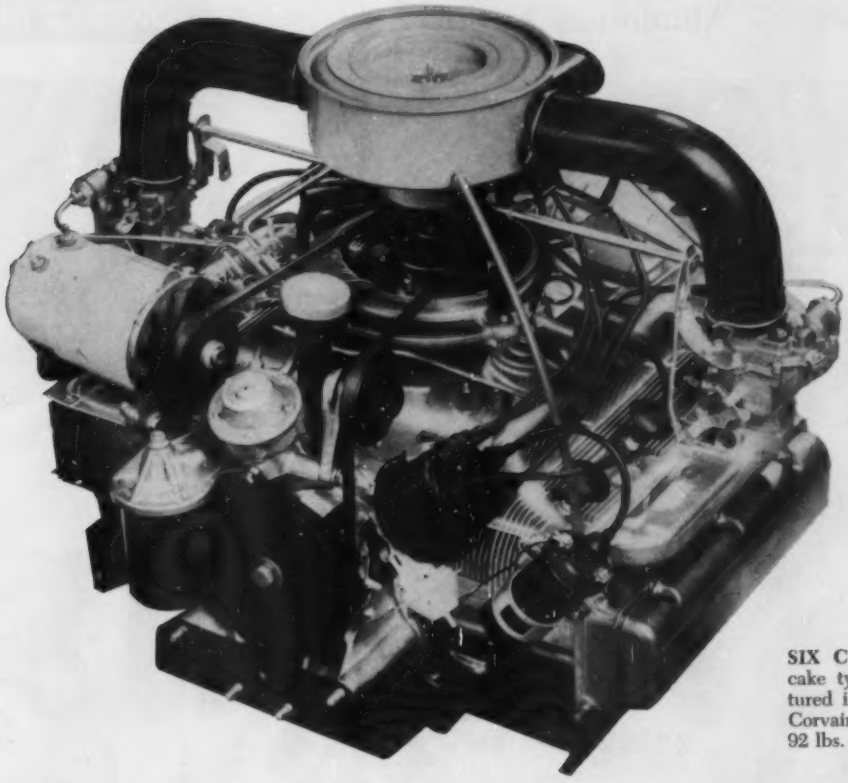
WET STEEL cylinder liners were used in the Marmon. The cooling water circulated against the steel. Special seals prevented leakage.



PEERLESS also built a "V" 16 engine which was all aluminum. This car used aluminum wherever possible.



BODY as well as engine of the Peerless were of aluminum. The only example of this car is in the Thompson museum.



SIX CYLINDER pancake type engine is featured in Chevrolet's new Corvair. The engine uses 92 lbs. of aluminum.

He must also design so that major machine tools can be used for sufficient time to amortize their cost. Probably no fabricating methods are as flexible or as inexpensively tooled-up as die casting, permanent mold casting and extrusion.

COMFORT AND CONVENIENCE

In spite of the public demand for more economical operation, no large segment of the public will tolerate either an inconvenient or uncomfortable automobile. To secure economy, weight must be cut without any appreciable loss in comfort and convenience. What's more, the economical car must have nearly the same "pep" as the older, less economical cars.

PASSENGER SAFETY

One of the most compelling reasons for the greater use of aluminum in automobiles is passenger safety. As the size, weight, and horsepower of cars increased, so did the difficulty of stopping these cars within a safe distance. There comes a point where the area of braking surface is no longer great enough to stop a heavy car travelling at high speeds. The only answer is to decrease the weight so that available braking surface is again adequate. A companion approach is the development of the finned aluminum brake drum. Such a drum will dissipate the heat generated so that more effective braking can be done with the same drum area.

Another factor which favors the greater use of aluminum in automobiles is the probable lower danger to driver and passengers in the event of collision. With a lighter weight vehicle inertia will be materially lower so that there is less energy to dissipate. Further, due to its lower modulus, (aluminum 10×10^6, steel 29.5×10^6) aluminum absorbs more energy than comparable amounts of steel. Evidence of this is found in the use of aluminum to replace high grade steel for armor plate, for example.

Any one of these reasons for the use of aluminum would be enough to encourage its wider use. In ag-

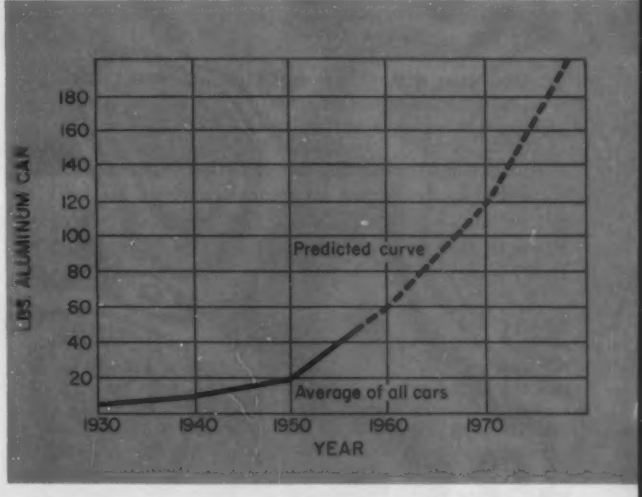
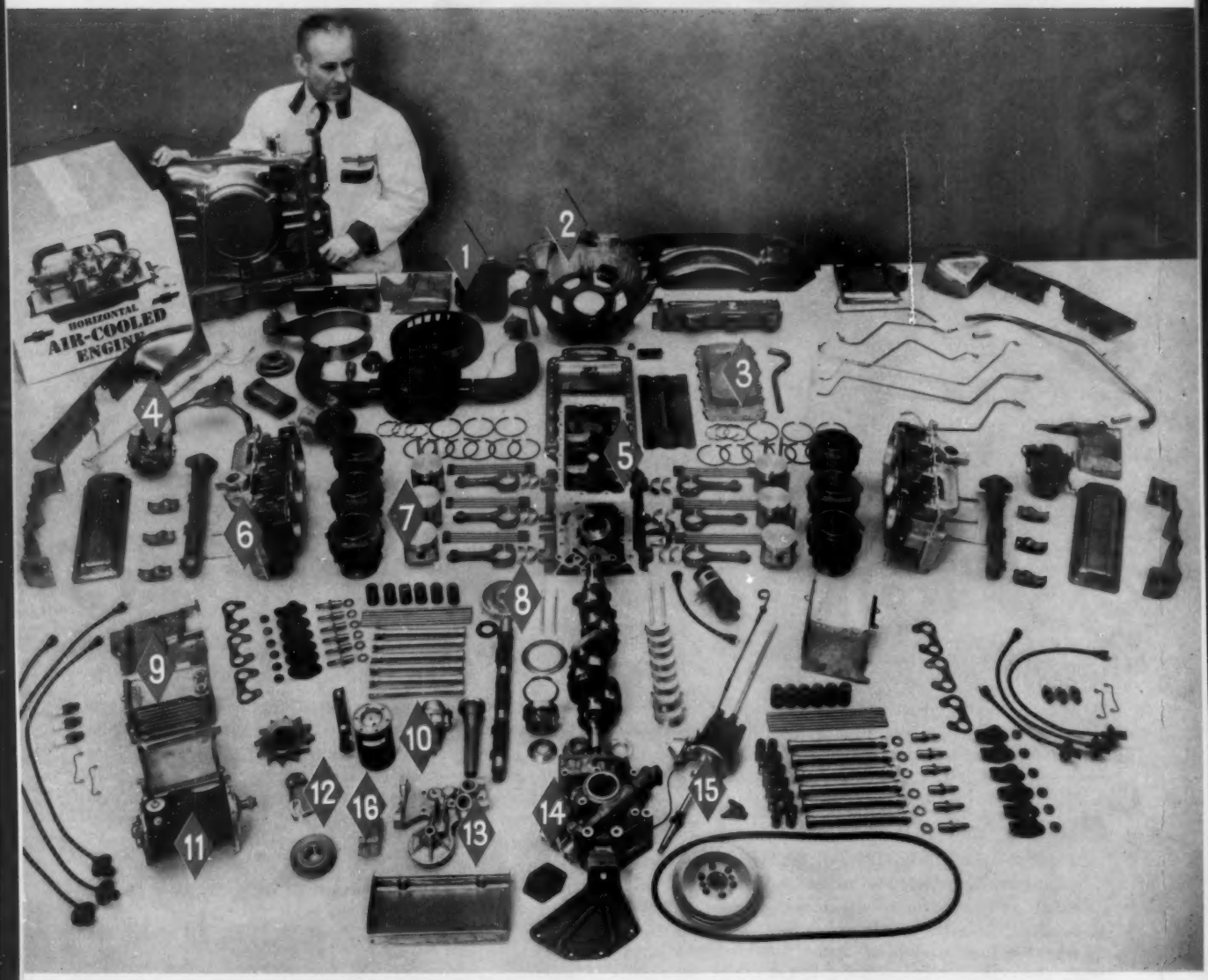


FIG. 1 The growth of aluminum in automobiles may be just starting. The next 20 years could be phenomenal.

Here's Corvair's Aluminum Engine



gregate, and with others not mentioned, it could very well be that the curve for projected use of aluminum (figure 1) is conservative.

As vacuum die casting becomes more widely used it is probable that more structural castings in the high silicon alloys (11 to 18% Si) will be made. The high strength shown by this material makes it most attractive for automotive uses.

Editor's note: Most of the material for this article was contributed by Mr. Frank Jardine, former development engineer, Aluminum Co. of America, now retired; Reynolds Metals Co.; and the Chevrolet Div., General Motors Corp. Other material was contributed by Ruth Franklin, director, Thompson Auto and Aviation Album; and the Aluminum Co. of America.

Since some of the material stemmed from the memory of Mr. Jardine, Mr. T. D. Stay of Reynolds Metals Co., and the editor, there may be some small inaccuracies, particularly as to dates. If any of these have crept in we believe that they are minor.

THE CORVAIR ENGINE, exploded to show the aluminum parts. These account for 92 pounds of aluminum.

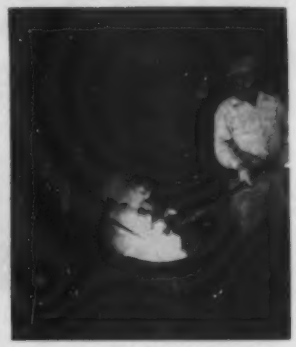
1 Starting Motor Assembly.
2 Clutch Housing (8 lbs.)
3 Crankcase Cover (3 lbs.)
4 Carburetor Assembly
5 Crankcase (28 lbs.)
6 Cylinder Heads (2) (31 lbs.)
7 Pistons (6) (5 lbs.)
8 Camshaft Timing Gear (1 lb.)
9 Oil Cooler Unit
10 Fuel Pump Assembly
11 Generator Assembly
12 Idler Pulley Bracket
13 Oil Filter and Generator Adapter
14 Crankcase Housing Assembly (7 lbs.)
15 Distributor Assembly
16 Oil Cooler Adapter

Casting The Liberty Bell

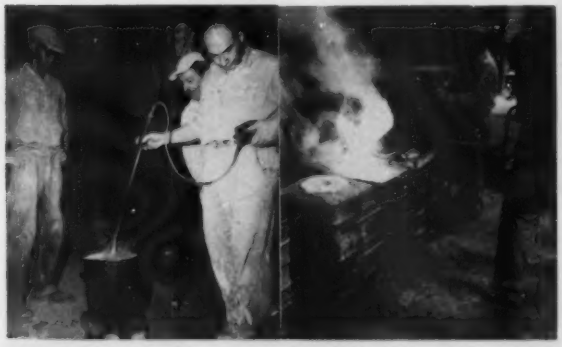
INVESTMENT CAST, this replica of the liberty bell is the official emblem of the U.S.S. Independence. Even the cracks and bolts of the original bell are faithfully reproduced.

A SCALE MODEL of the Liberty Bell was recently cast by the investment casting process. The occasion the launching of the U.S.S. Independence, a newly commissioned aircraft carrier and one of the largest ships in the world.

The casting was made by Roman Bronze Works, Inc. in association with General Bronze Corp. The replica was presented by the Copper Industry and the Copper & Brass Research Association.

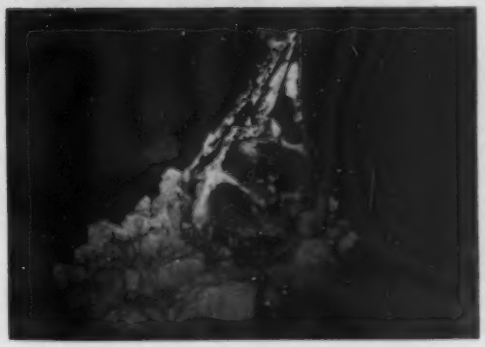


METAL PREPARATION is important if a good casting is to be made. Above and left are two stages in the purification process, fluxing and skimming of the dross.



THE WRONG temperature and the casting is runied. That's why metal temperatures are checked and controlled before pouring. A portable pyrometer is used.

CLEAN METAL at the right temperature is poured, above, to make the bell. After cooling the mold is broken off, right, and the casting is ready for finishing.



A MILLION POUNDS A MONTH

. . . That's one company's metal handling problem

MOVING INGOTS from boxcars to storage is a common problem in metalworking plants. But Kawneer Company found how to cut the time of this job by more than one-third.

The saving came through the use of a fork truck with the ability to maneuver faster within a boxcar, travel faster up grades to the storage area and pick up and set down its load faster.

Aluminum ingots – 800-pound sows and palletized 50-pound pigs – are a big part of the metal moved. In an average month, one million pounds of ingot are transformed into billet and sold as billet or finished extrusions.

Each pound is handled a number of times – in the form of ingot, billet or extrusion – by the same fork truck that unloads boxcars. A second fork truck transports mobile self-dumping hoppers from places in the production line where scrap is generated.

Unloading of a 100,000-pound carload of aluminum is done in well under an hour by a fork truck (4,000 lb. @ 24" center) manufactured by Clark Equipment Company's Industrial Truck Division. Before purchase of this truck, the operation required at least 90 minutes, using a less maneuverable fork truck.

INGOTS RECAST INTO BILLETS

Carrying sows or palletized pigs directly to storage, the fork truck completes unloading and stacking in uninterrupted cycles.

Later ingots are moved from storage directly to melting furnaces. The same fork truck that unloads boxcars frequently charges the furnace, although an older truck sometimes is used. In this operation, ingots are placed upon the furnace hearth and forks are withdrawn and raised slightly. Then the truck moves forward, pushing the ingots into the furnace.

1 IN LESS THAN AN HOUR, 100,000 pounds of aluminum is unloaded and put into storage in the yard.

2 EXTRUSION BILLETS, cut to length are handled on pallets from the casting area to the extrusion billet heater.

3 CUTOFFS FROM EXTRUSION are put into hoppers to be taken back to the melting furnaces.

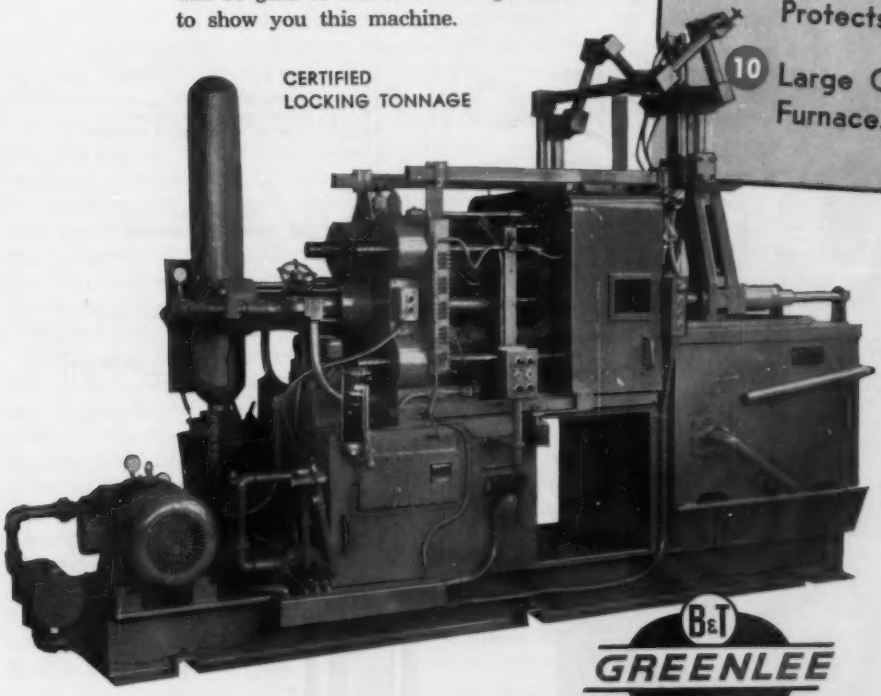
4 SELF-DUMPING scrap hoppers makes furnace charging both safe and easy. Only heavy scrap is remelted.

10 big reasons why B&T offers you a superior AUTOMATIC ZINC DIE CASTING MACHINE...

The extra strength and precision built into B & T Die Casting Machines gives you thousands of hours of trouble-free operation . . . helps you to increase production and reduce operating costs.

See this B & T Automatic Hot Chamber Die Casting Machine in operation. Look it over. Note the motorized die height adjustment, automatic die lubrication, large conveyor area for automatic part removal, and many other advantages that really pay off on the production floor. Your B & T representative will be glad to make all arrangements to show you this machine.

1. Extra Built-in Beef and Rigidity.
2. A Precision Machine.
3. Four-Toggle Locking Linkage.
4. Massive Tie-Bars.
5. Heavy, Rigid Platens.
6. Automatic Lubrication.
7. Motorized Die Height Adjustment.
8. Automatic Die Lubrication.
9. Low Pressure Closing System Protects Dies.
10. Large Capacity Furnace.



OTHER GREENLEE PRODUCTS

Transfer Machines
Special Machines
Automatic Bar Machines
Woodworking Machines
Tools for Woodworking
Hydraulic Tools For Craftsmen

B&T GREENLEE DIE CASTING MACHINES

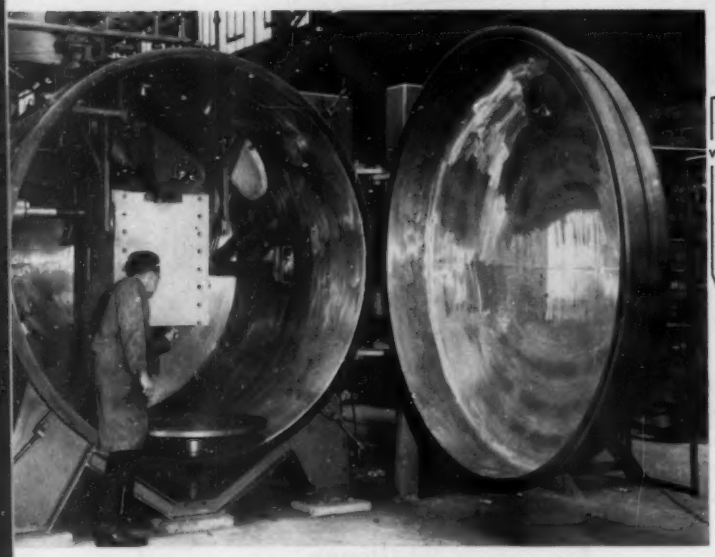
A Complete Line of Hot and Cold Chamber Die Casting Machines
Trim Presses

B & T MACHINERY COMPANY

A DIVISION OF GREENLEE BROS. & CO.

217 W. 8th St., HOLLAND, MICHIGAN, Phone EXport 2-2341

Circle No. 13 on Reader Service Card



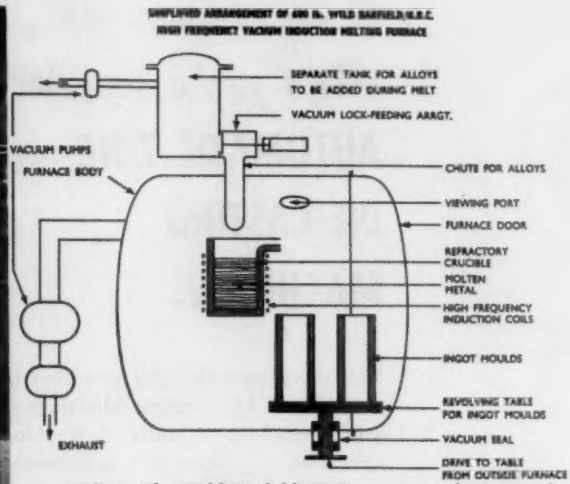
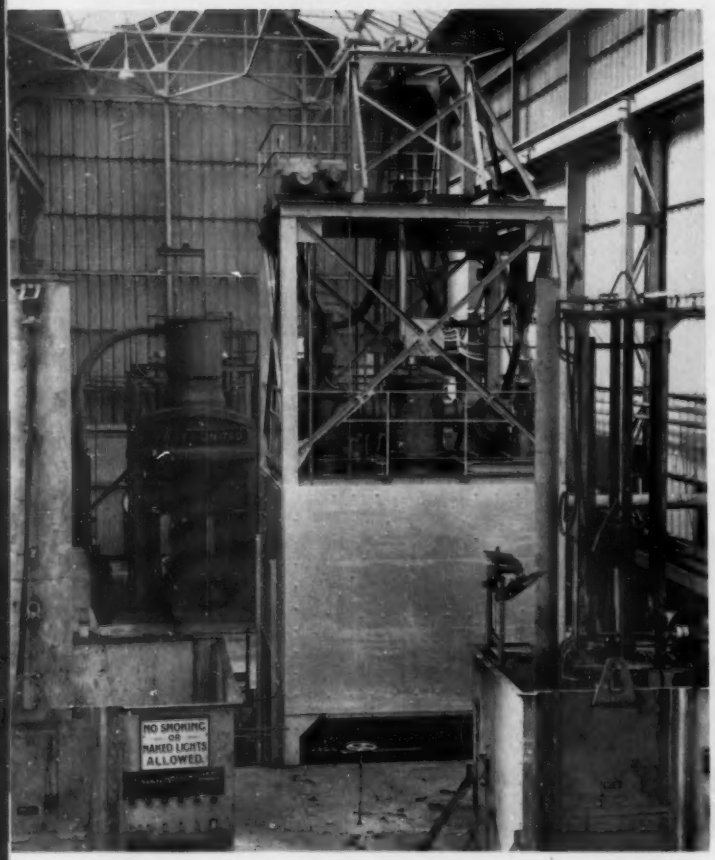


FIG. 1 The Wild-Barfield/NRC vacuum induction melting furnace. This 600 lb. capacity furnace can be charged, the melt made and poured without breaking the vacuum.

VACUUM MELTING FOR THE NEW METALS

By STEPHAN E. SCHATTMANN *London, England*



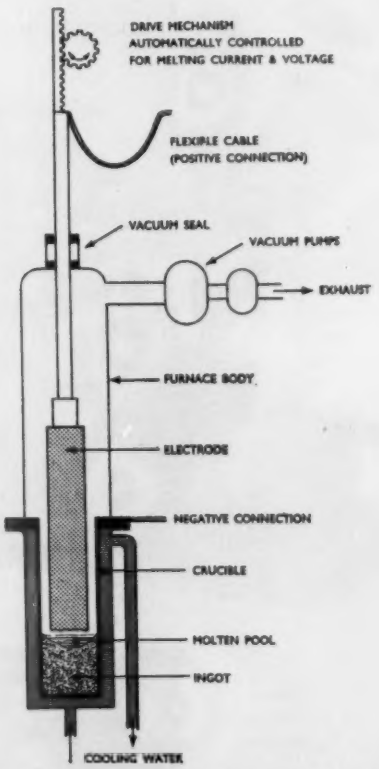


FIG. 2 The Heraeus consumable arc melting furnace. This unit can make vacuum melted ingots ranging in size from 120 lbs. to 2½ tons of steel or titanium.

THE RAPID TECHNOLOGICAL progress in post-war Britain, especially in the aircraft and nuclear industries, has stimulated the demand for new materials able to resist high temperatures. Some of these materials need special forms of processing. Neither titanium nor zirconium can be subjected to normal air-melting, but must be melted in a vacuum. Again, in nuclear applications it is frequently essential to reduce certain trace elements to a minimum. Vacuum melting permits close control of the chemical composition of every melt, enables certain elements to be completely removed and others kept to a pre-determined minimum. Some alloy steels, particularly those containing titanium and aluminum, improve in strength by the elimination of gaseous impurities that vacuum melting makes possible.

Jessop-Saville Ltd. of Brightside Works, Sheffield, England, have been engaged for a number of years in a comprehensive research and development program of new alloys and metals. They have given particular attention to the vacuum melting of titanium, zirconium and alloy steels.

AT JESSOP-SAVILLE

Early in 1956, the first development stage was completed and full-scale operation of the vacuum melting plant began. The two units then operating were of the consumable electrode type. They could produce titanium ingots with a diameter up to 20 inches and one ton in weight. Zirconium ingots also were produced. Included in the equipment was a small 20 pound vacuum induction melting furnace, originally installed for research work, which was used for some commercial work including the making of small precision castings. A temporary shortage of titanium sponge provided an opportunity to experiment with the re-melting of steel in vacuum.

With increasing demand for vacuum melted metal the existing plant was not able to satisfy all requirements, especially for the larger forgings. Production facilities had to be expanded. A Wild-Barfield/N.R.C. vacuum induction melting furnace (fig. 1) and a Heraeus consumable arc melting furnace (fig. 2) were installed, both of which have been in full production since the middle of 1958. The combination of the two types provides vacuum melting facilities to produce the largest ingots in Europe. Moreover, it is probably unique that vacuum melting of steel by both consumable arc and by induction methods is done in the same plant which produces vacuum melted ingots of titanium and zirconium.

INDUCTION MELTING

The Wild-Barfield/N.R.C. induction melting furnace has a capacity of 600 pounds. It is designed for semi-continous operation. The furnace can be charged through a bulk charging hopper without breaking the vacuum in the melting chamber. The principal unit is a horizontal, stainless steel vacuum chamber approximately 7½ feet in diameter and 9 feet long. The chamber is water-cooled by copper coils brazed to the outside and the end is sealed by a hinged door. Inside is the high-frequency induction melting coil designed to tilt about the pouring axis. In front of and below the furnace is a rotary mold table. This allows several ingot molds or castings to be poured.

A cylinderical chamber on top of the melting chamber contains the alloy charging mechanism. This contains a 2,200 cubic inch bulk charging hopper which holds 300 pounds of material, and four smaller hoppers of 90 cubic inches. Each small hopper holds 12 pounds of alloy. Both bulk charge and alloys are delivered to the crucible by a vibrating feeder through a 6 inch diameter vacuum lock. The charging chamber can be refilled without breaking the vacuum in the main tank by closing the vacuum lock. After the furnace has been re-charged with metal, the melting chamber is evacuated by a 16 inch diameter high vacuum pump and a 6 inch diameter rough pump. The pumps will reduce pressure in the chamber from atmospheric to 1 micron of mercury in 15 minutes.

The melting process can be observed at all stages through three inspection windows. The external controls include: a bridge breaker for breaking the top layer of unmolten metal, an immersion thermo-couple pyrometer, a sampling device which can be extracted through an air-lock without breaking the main tank vacuum, a sighting tube for optical pyrometer readings, and an internal light assembly to illuminate the tank interior.

ARC MELTING

The Heraeus consumable arc-melting furnace consists of a large vacuum tight vessel. The actual melting is carried out in the copper crucible which forms the lower half of the furnace. An electrode is placed inside the furnace where it is welded on to the feeder rod. An electrical control unit drives the feeder rod as required by the melt. Arc gaps can be maintained within fine limits with the help of this unit. The feeder rod also carries the melting current of 14,000 to 16,000 amps., through sliding vacuum seals, to the electrode.

The melt is started by striking an arc between the bottom of the electrode and a small charge placed at the bottom of the crucible. Molten metal sprays down to form a pool which in turn solidifies to form the ingot. As the pool of molten metal is small, melting conditions must be kept constant throughout the melt.

A view of the melt is projected on to the control panel from which the furnace is remotely operated. The vacuum equipment works automatically without any supervision. It is capable of maintaining melting pressures below one micron of mercury. The combined speeds of the two pumps, one each of the roots and booster type, are 4,000 liters per second for air and 10,000 liters per second for hydrogen. For safety, the arc current is interlocked to all operations which, should a fault develop, could lead to dangerous conditions.

In this furnace, titanium ingots from 9 inches diameter (120 to 140 pounds) up to 24 inches (exceeding 2½ tons) can be produced. The plant also is suitable for the production of zirconium ingots. For the

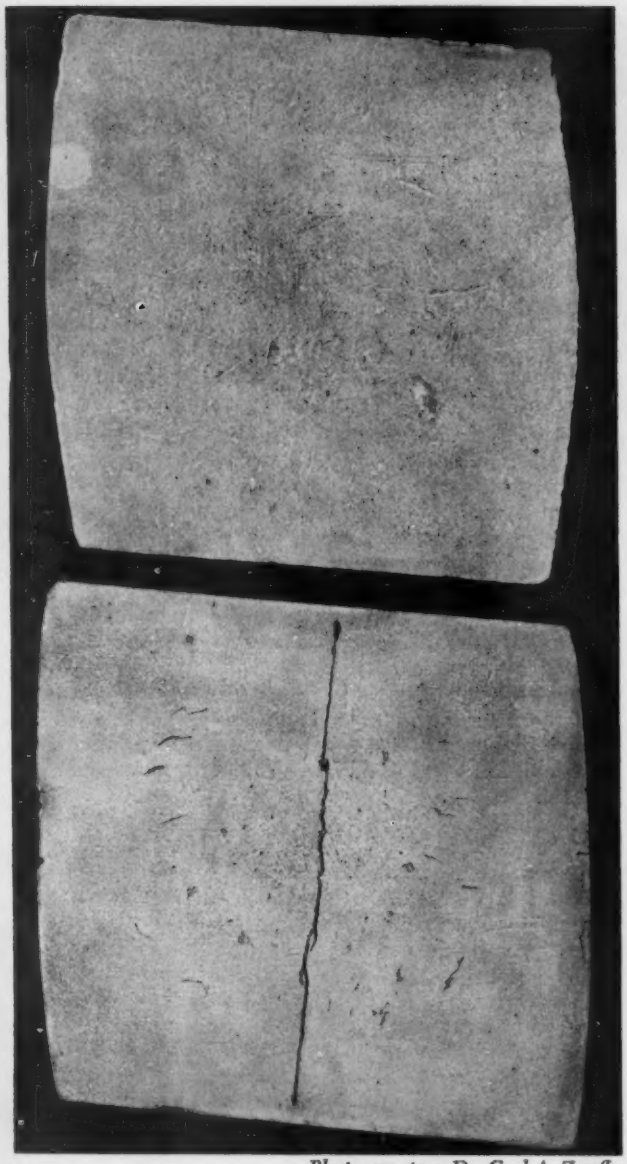


Photo courtesy Dr. Carl A. Zapffe

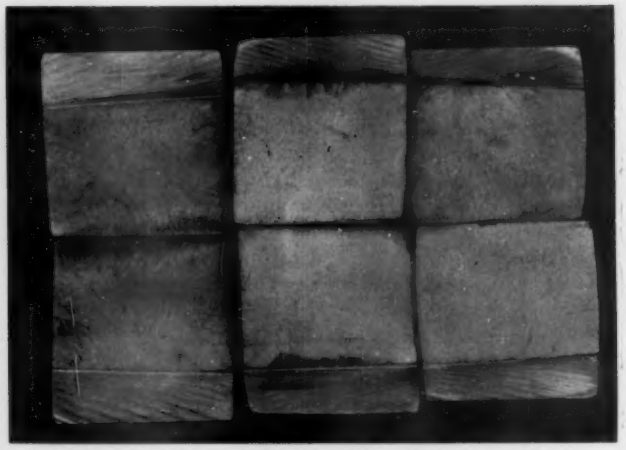


FIG. 3. Typical fractures of alloy steel. Above, hydrogen free steel with good fracture and impact properties. Below, high hydrogen content steel, almost self shattering.

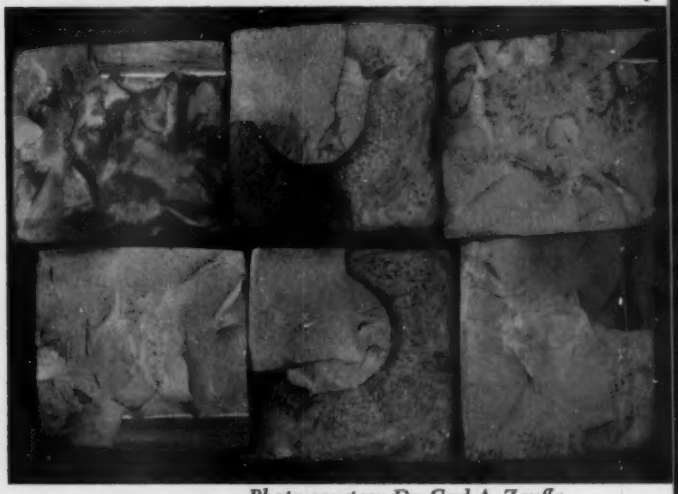


Photo courtesy Dr. Carl A. Zapffe

FIG. 4 Macrostructure of low hydrogen steel (top, left) and high hydrogen content steel (bottom, left). The internal crack is typical of high hydrogen content steels.

time being their maximum weight will be 800 pounds. Steel ingots can be produced in the same sizes.

WHY VACUUM MELTING?

The freedom from non-metallic inclusions in vacuum melting ensures that the transverse ductility of forged discs is improved. Tensile tests of vacuum melted 12% chromium steel discs, for instance, show an elongation value four times greater than was obtained on discs made from air-melted materials. In ball-bearings and ball-race steels the freedom from non-metallic inclusions is particularly important since impurities might create wear and premature failure. Dies for the production of molded components with as near a perfect surface finish as possible are another example of the importance of "cleanness" which vacuum melted metals provide.

Vacuum melting also reduces the total gas content of the metal. Tests made by Jessop-Saville Ltd. have shown that the remelting in vacuum of air melted alloyed steels reduces the total oxygen, hydrogen and nitrogen content from 600 parts per million to 200 parts per million. This aspect of the vacuum melting process is particularly useful in producing stock for precision castings or re-melting prior to precision casting.

Lowering the total gas content of titanium, zirconium, and alloy steels is important, particularly lowering the hydrogen content. Many steels exhibit delayed failure which has been traced to hydrogen embrittlement. Steels appear normal until they are subjected to repeated high stresses, as for example in die casting and extrusion dies. Failure may occur for no apparent reason. Many of these failures have been traced to hydrogen embrittlement.

continued on page 79

TO SAVE A LOT...

REDESIGN A LITTLE

REDESIGN A LITTLE and save a lot. That's what The Halsey W. Taylor Co., Warren, Ohio, manufacturer of drinking fountains and electric water coolers, did when they decided to use sinterings.

Two sintered parts go into a self-closing drinking fountain valve, which automatically shuts off the water when the handle is released. Accurate adjustment of the valve handle is needed to get minimum free play when the handle is turned, and to make sure the water shuts off when the handle is released.

This adjustment is made by a positive locking device, one of the unique features of the Halsey Taylor self-closing stop. When the handle is installed, the valve is seated by setting the position of the valve stem with a valve adjusting nut, one of the sinterings. The other sintering, a lock sleeve, is slipped over the adjusting nut to prevent the valve from loosening, even after constant use.

The valve stem adjusting nut (Figure 1b) has inside threads and outside teeth. The lock sleeve (Figure 1a) has internal teeth that interlock with the teeth on the adjusting nut to prevent it from turning once it's set. The lock sleeve itself is then held in place by a slot which fits over the end of the valve stem.

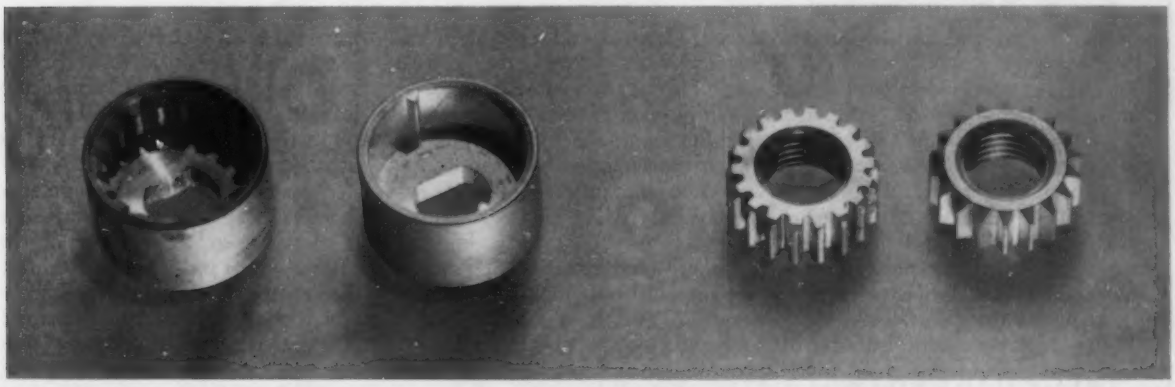
The adjusting nut originally was made from an extruded shape, supplied with the teeth already formed. The nuts were machined, cut off, and tapped. However, the standard shape which most nearly met their needs was an involute gear shape. This type of tooth was expensive, really wasn't needed.

When the adjusting nut was redesigned as a sintering (made by Merriman Bros., Inc.), its cost was reduced about 33%. Since the teeth are used only for locking, they now have straight sides. And, the only finishing needed is to tap the hole.

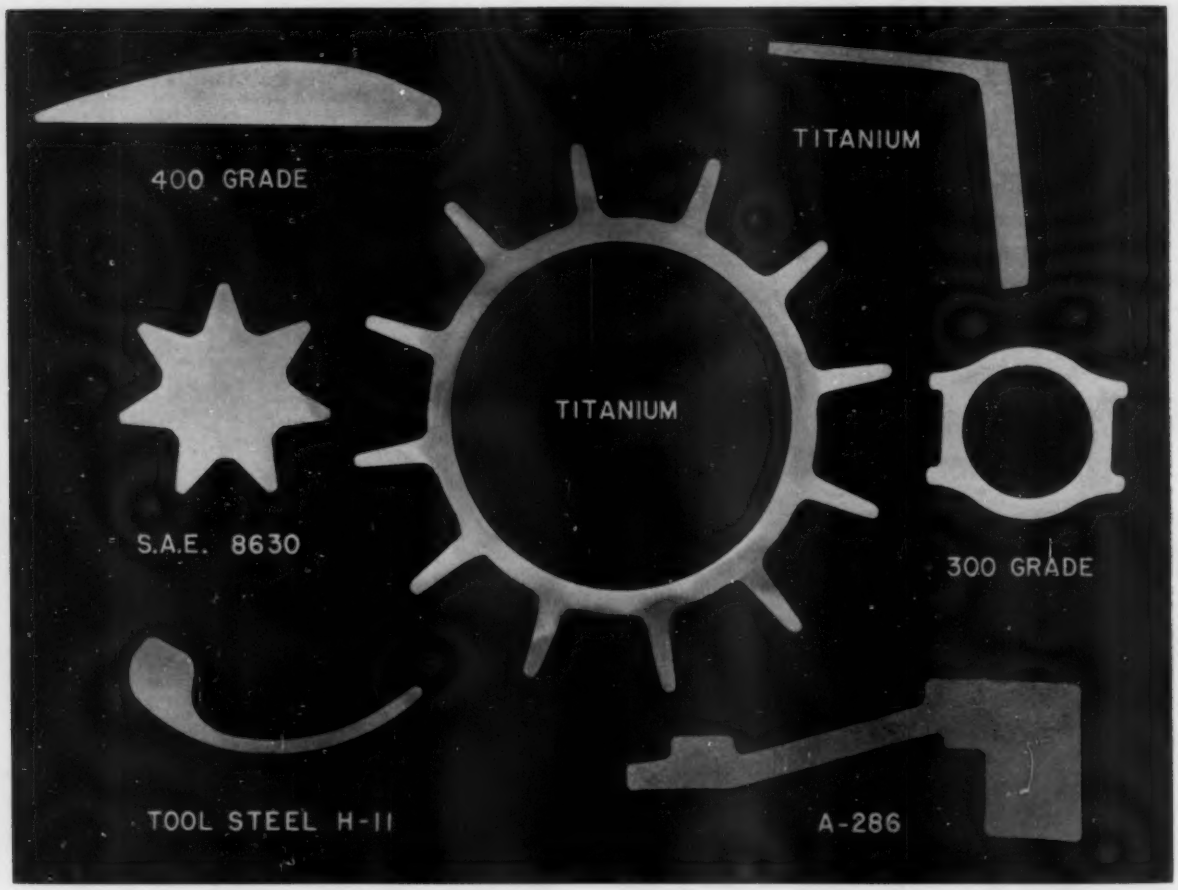
The lock sleeve formerly was machined in a screw machine from round bar stock. The hole was first bored, then undercut for clearance so the teeth could be broached. The slot in the top also was broached.

As a sintering (produced by Powder Metal Products, Inc.), its cost has been cut in half. The lock sleeve is now used as sintered, with no machining or other finishing needed. Its design also was simplified. Since the only function of the teeth is to prevent the adjusting nut from turning, all 18 teeth weren't needed. So, the redesigned sleeve has only two teeth, which do the job adequately. Naturally, the undercut for broaching was eliminated.

Although the sinterings are not in direct contact with water, they are exposed to condensation and other moisture. Therefore, the powdered metal used in both parts is a leaded brass alloy.



1 SINTERED BRASS has replaced machined, wrought parts in the valve locking sleeve (a), left, and the valve adjusting nut (b), right, in self-closing valves made by The Halsey W. Taylor Co.



EXTRUSION OF FERROUS METALS

By J. H. RICE, *Allegheny Ludlum Steel Corp.*

HOT EXTRUSION is now over 70 years old. Lead and tin were among the first metals extruded, then aluminum and brass. For several years, development centered around aluminum and copper base alloys, and extrusion of these metals has contributed extensively to both aircraft and architectural fields.

The wide variety of products made in aluminum and copper encouraged extruders into utilizing this process for the conversion of steel into shapes, bars and hollow sections. This work was attempted first as early as 1925. All that was accomplished was to push steel through a die. The higher temperatures required to make steel flow and the high pressures needed caused rapid deterioration of the dies; also the product had no dimension integrity.

Concentration was placed on the development of new die materials and a suitable lubricant which would be compatible with the extrusion of steel. The French did extensive work along these lines, notably the classical work of M. Jacques Sejournet, which introduced glass as a lubricant. This development allowed the extrusion of steel with some success.

When glass is used as an extrusion lubricant, the billet is heated to extrusion temperature and transferred to the press container. As the heated billet rolls into the loader, it passes over a bed of powdered glass, usually −100 mesh, or over a 10 mil thick sheet of fiberglass. The heat of the billet causes the glass to fuse to the billet, providing a uniform liquid coating on the billet as it enters the container. The die is protected with a glass wool product or a preformed sintered disc of powdered glass. Mandrels for tubular products are lubricated by introducing powdered glass into the hole in the billet.

The glass used must be compatible with both the extrusion temperature and the alloy. Some glasses will break down and react with the alloy, thereby decreasing lubricity. Glass also serves as a thermal insulator to protect the extrusion tools.

Even though many developments have taken place in the extrusion of metals from temperatures above 1700°F, these metals do not exhibit the versatility in the extrusion press which metals in the general field of aluminum and brass show. The extrusion of aluminum takes place at 900-1000°F at extremely slow speeds (40″/min). The normal tool

steels used for dies and containers do not lose hardness at these temperatures and, therefore, maintain dimensions from push to push. The low temperature also eliminates or limits use of solid film lubricants, permitting direct contact of the die and the extruding metal. High quality surface finish and dimensional stability result.

The use of glass allows the extrusion of metals above the transformation temperature of the dies, but the dies have to be opened to permit the flow of glass along with the flow of the metal. Because the glass takes some space, some product versatility is lost, and surface quality, as compared to counterparts made in copper or aluminum, suffers.

Today, however, 10 years after Sejournet's development, steel and its alloys, titanium and its alloys, nickel and its alloys, and molybdenum and its alloys are being extruded.

The demand for higher quality as-extruded products in steel and high temperature alloys has greatly increased. At Allegheny Ludlum, therefore, extensive development has been under way for some time to advance the state of the art comparable to that of aluminum or brass.

The need for extensive and further glass development has been under constant investigation, along with new tool material and process developments for new alloys.

Among the outstanding developments has been the development of an extrusion practice for the high temperature alloy A-286, an alloy extremely difficult to extrude. The alloy exhibits high resistance to deformation (the unit pressure required to effect metal flow at a given temperature) and the product exhibits excessive deterioration. The severe deformation during extrusion caused excessive stressing of the titanium-complex phase in this alloy, and caused ruptures at the die bearing. The minimum area that could be extruded with any reproducibility was 2 sq. in., which represented an extrusion ratio (cross-sectional area of upset billet: cross-sectional area of product) of 13/1.

The variables of extrusion were studied and showed that from a metallurgical standpoint the temperature had to be lowered. This further complicated the extrusion of the alloy. The results of a glass investigation yielded a suitable composition which increased lubricity. The press speed was investigated along with some die design changes, and this alloy can be produced now in shapes and tubes with cross sectional areas less than 1 sq. in.

In any alloy, each shape represents a certain amount of development and the application of empirical information. Figure 1 shows some of the most recent shapes that have been produced.

There is a great potential in the field of ferrous metal extrusions. Some possibilities are:

- Conversion of highly alloyed metals with reduction greater than any other form of hot metal working.
- Production of shapes and hollows that have no place in production rolling equipment.
- Production of limited quantities, taking advantage of a low die cost vs. expensive roll cost.
- Production of extremely thin and complex sections to replace the structures now made in aluminum in the fast growing field of Mach 3 aircraft and space vehicles.
- To convert ingots to intermediate products and final products in one pass.

In the next 10 years, extrusion will advance to a position as a necessary part of any steel works with new and varied processes and products.

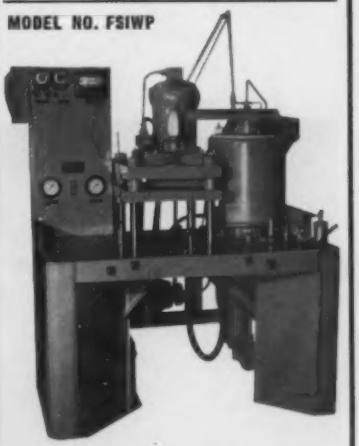
It is probable that extrusion of the ferrous and exotic metals will develop along the lines it has in Europe. There, due to the low per capita consumption of steel, rolled shapes are not economical. Extrusion has, therefore, become more widely used for the preparation of shapes which are normally rolled in this country.

The relatively low cost of dies compared with forming rolls is an important economical factor. It lets the designer specify a semi-finished shape so that finish machining is drastically cut. Another economy is found in machining long lengths rather than the small pieces normally machined from bar stock.

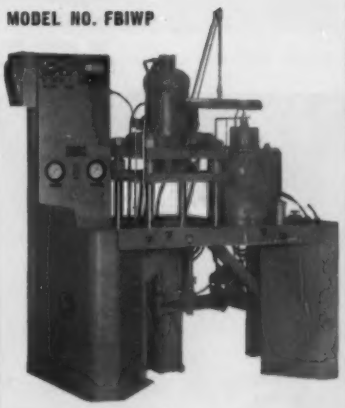
NEW

3½ lbs. WAX CAPACITY ON STANDARD MODEL #FSIWP

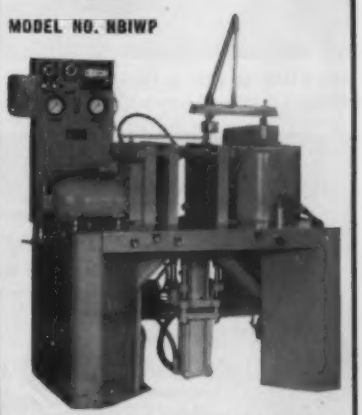
MODEL NO. FSIWP



MODEL NO. FBIWP



MODEL NO. HBIWP



For complete details write direct to Leyden Hydraulics

Any Type or Size Unit Built to Your Specifications.

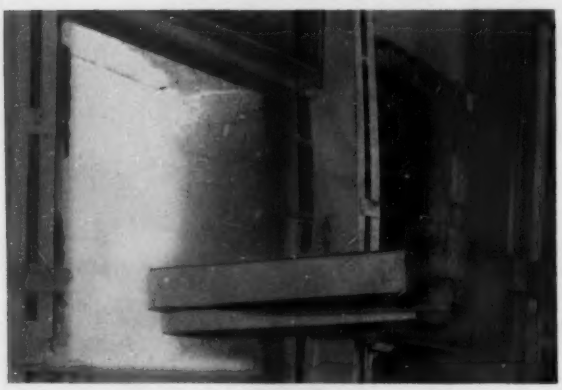
LEYDEN HYDRAULICS, INC.

1800 North River Rd. • Melrose Park, Ill.

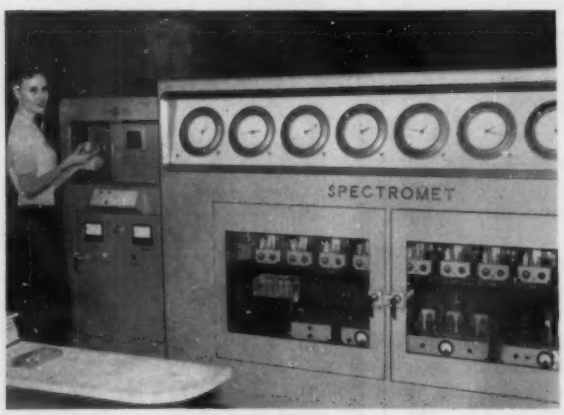
Photo tour of The William L Bonnell Co., Inc. plant shows

WHAT GOES INTO MAKING

DESIGNING AND BUILDING the die holds the key to successful production of the extrusions.



ALUMINUM PIG is lifted into one of three melting furnaces where it is alloyed for casting into extrusion ingots.



CHEMICAL ANALYSIS of samples from each heat takes only a few seconds, giving accurate reading of eight elements before extrusion logs are cast.

IN PRINCIPLE, extrusion is a simple process. Push a billet through a female die to get a bar with a uniform, designed cross section.

In practice, you need massive machinery to do the pushing, plus closely controlled furnaces, and stretching, straightening, handling and finishing machinery.

To show you what goes into making quality aluminum extrusions, the basic steps in the process are depicted here. Photos were taken at the Georgia plant of The William L Bonnell Company, Inc. whose eleven presses extrude more than 70 million pounds of aluminum a year.

At this plant, they make all their own tooling, melt and chill cast their own billet and carry the process through polishing and anodizing.

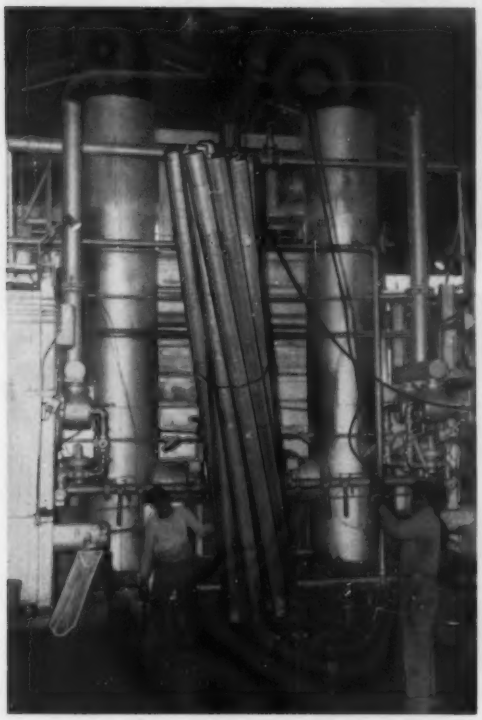
Two new presses, recently installed, will increase the company's capacity to meet a booming demand for extruded aluminum . . . not only for use in architectural and decorative applications, but also in boats, appliances, furniture and a growing list of industrial and commercial products.

Each step in the process, as shown here, plays an important part in getting the shape, physical properties and specified surface finish. Design of the die and precise control of alloy composition are critical starting points in a sequence of operations aimed to give the product designer what he needs.

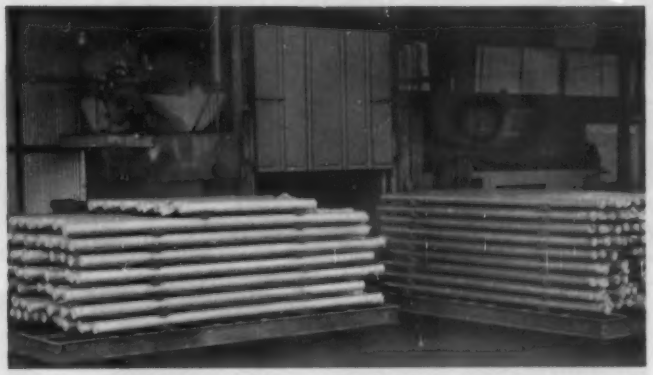
continued on page 52

POURING MOLTEN ALUMINUM into direct chill molds produces 16′ logs, later cut to lengths convenient for the extrusion process. Sound metal structure starts at this stage.

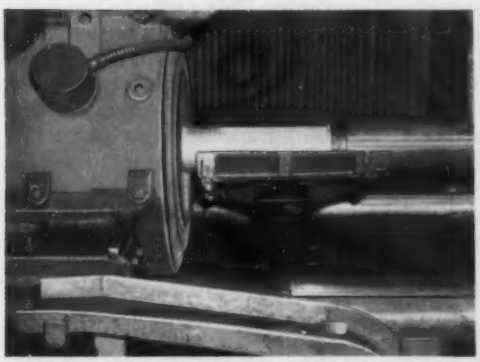
ALUMINUM EXTRUSIONS



OUT OF THE CASTING UNIT come ten aluminum logs, ready for heat treating and sawing to length.



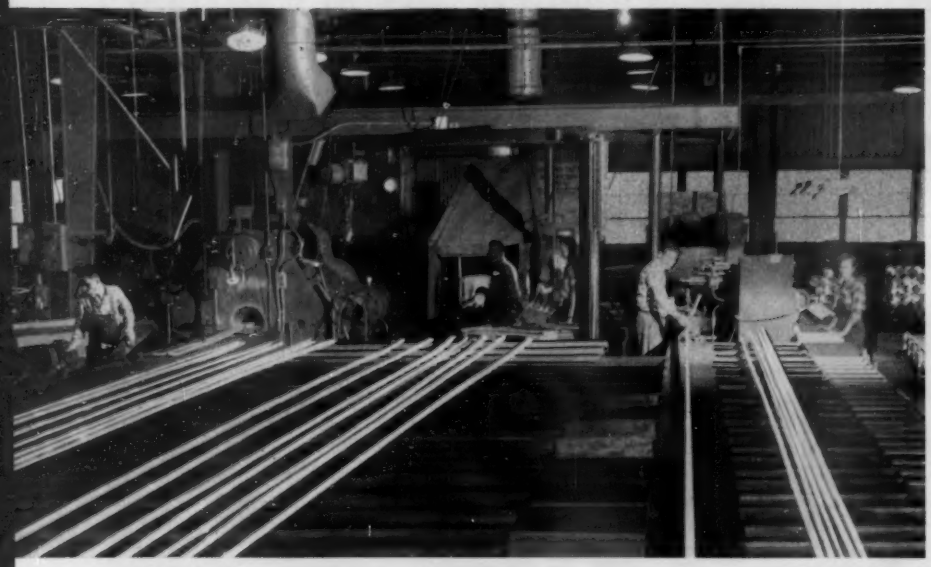
HEAT TREATMENT in a homogenizing furnace gives extruded shapes better finish and heat treating qualities.



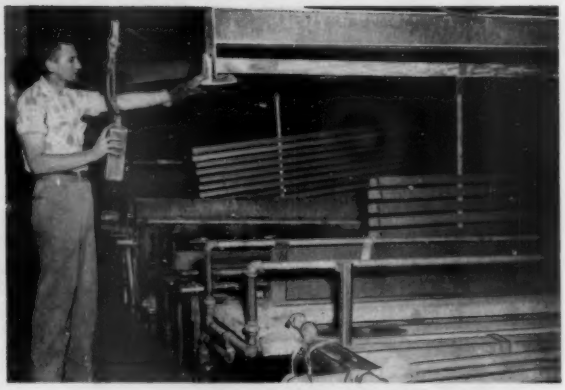
HYDRAULIC PRESSURE behind the aluminum billet pushes it through the steel die, squeezing the aluminum into the desired shape.

THE INSPECTION PROCESS BEGINS as soon as the metal emerges from the die. Here an inspector gives visual check to the newly formed extrusion. Two separate extrusions are shown being formed from one die.

MAKING EXTRUSIONS: THE FINISHING TOUCH



UPWARDS OF 100 TONS PER DAY come from Bonnell's eleven presses. Shown (left) is a press with tables for run-out, cooling and sawing. Preliminary check is made (above) for twist and straightness as soon as the metal is cool enough to handle. One of a battery of automatic polishing machines (below left, and a series of anodizing tanks (below right) are part of the extensive finishing department set up to provide more than a dozen specified finishes.



More and more designers have been specifying aluminum extrusions in their products in the past few years. The resulting growth of the industry has been reflected in an upsurge of shipments. From 393 million pounds in 1953, shipments had almost doubled by 1959.

One of the outstanding examples of growth is the story behind the aluminum extrusion plant pictured on these pages.

Back in 1928, the owner of a floor covering shop in Columbus, Ohio, had a bright idea. Why not put polished aluminum edging around linoleum? Experimenting in his home workshop, he came up with six shapes. Aluminum Company of America, then the only prime producer, agreed to run the shapes for him. For nearly a year these moldings were tried out before being put on the market.

The idea got quick acceptance from his customers. Then the need for more shapes became apparent. The young man, William L Bonnell, began trying hydraulic extrusion methods to make his own moldings. By 1939 he was able to finance the installation of an extrusion press.

This early use of extruded aluminum was a forerunner of hundreds of other applications. Last year, the American extrusion industry shipped more than 800 million pounds of extruded aluminum.

The war years brought the Ohio firm into top secret government work to help in developing a method of shaping radioactive materials used in the first atomic bomb. Working closely with scientists from leading schools and universities, Mr. Bonnell was able to devise a method of extruding the material to the needed size and shape.

After the war, he became president of Trimedge, Inc., and in 1955 formed The William L Bonnell Co., Inc., buying Trimedge and incorporating its tradename and line of decorative moldings into a broader line of aluminum products.

Within two years, plant capacity was increased 325 percent. Number of presses has multiplied and the firm now has about 1100 employees. Its national sales organization has been developed to encompass market areas all the way to the West Coast.

As a footnote, the original six shapes dating back to 1928 are still in the company's catalogue.

Improved finishing systems will help promote . . .

A 15 - 17% INCREASED USE OF ZINC

THERE'S GROWING EVIDENCE, that the consumption of zinc die castings by the automobile industry in 1960 will be at a higher rate than increased vehicle production.

Most of the gain must be credited to improved methods of chromium plating. In spite of the lower production costs, which are possible through the use of zinc die castings, the poor performance of chromium plated parts had forced the automobile manufacturers to aluminum and stainless steel.

With the new systems of plating[1] chromium plated exterior trim now will last as long as any other part of the car. Manufacturers are able to turn again to low cost chromium plated zinc die castings. The average weights per car are given in the table at the right.

One factor which is limiting the use of zinc die castings is the inability of many commercial plating shops to apply the newer finishes. A moderately large capital investment is required to convert existing plating lines. Many job shops either can not or will not spend the money. One solution to this problem is the growing number of contract die casters who are installing fully automatic plating lines so that they can supply their customers with completely finished parts. As more and better plating facilities come into being the wider use of zinc die castings seems assured.

Speaking of the future, J. L. Kimberley, executive vice president of the American Zinc Institute said: ". . . The increase in usage by the automotive industry is notable. Perhaps the most significant change in the automotive industry usage of zinc die castings has been in the areas of grilles, instrument cluster housings, dash and crash panel bases, and door handles.

[1]*See PRECISION METAL MOLDING, for July, 1958, pg. 39; July, 1959, pg. 47; and Sept., 1959, pg. 71.*

ZINC WEIGHTS—1960 AUTOMOBILES

MODEL		F*	F-D*	D*	1960 TOTAL	1959 TOTAL
GENERAL MOTORS CORPORATION						
Buick	4 Dr. Hd. Top	12.38	76.40	20.15	108.93	81.32
Cadillac	4 Dr. Hd. Top	16.11	56.99	16.03	89.13	90.27
Chevrolet	4 Dr. Hd. Top Impala	37.14	16.70	1.30	55.14	55.82
Oldsmobile	"98 4 Dr. Hd. Tp.	)			(91.30	56.00
	"88 Super	)	*No Breakdown*		(71.15	40.25
	"88	)			(64.40	33.50
Pontiac	4 Dr. Star Chief	16.92	43.43	23.00	83.35	69.05
FORD						
Ford	4 Dr. Hd. Top	13.67	31.83	16.69	62.19	56.96
Lincoln	Conv. Hd. Top	25.68	51.87	31.16	108.71	91.92
Mercury	4 Dr. Hd. Top	11.18	46.20	29.90	87.28	83.08
Thunderbird	Hard Top	24.45	20.52	14.75	59.72	48.38
CHRYSLER						
Chrysler	4 Dr. Hd. Top	11.00	45.70	4.10	60.80	54.12
De Soto	4 Dr. Hd. Top	8.80	30.93	14.49	54.22	61.12
Dodge	4 Dr. Hd. Top	9.59	30.07	18.565	58.225	63.94
Imperial	4 Dr. Hd. Top	11.00	47.49	34.24	92.73	84.22
Plymouth	4 Dr. Hd. Top	9.50	21.53	13.03	44.06	27.62
All — Station Wagons — *additional*			6.08			
AMERICAN MOTORS						
Ambassador	4 Dr. Hd. Top	)			(81.50	81.50
American	Small Sedan	)	*No Breakdown*		(39.00	39.00
Rambler	4 Dr. Sedan	)			(60.00	60.00
Rambler Station Wagon		)			(74.00	74.00
STUDEBAKER-PACKARD						
Hawk Series	Hard Top	)	*Plated Parts Only*		(45.00	45.00
Lark	Hard Top	)			(33.75	33.75
Unweighted average weights for these models					69.4	60.5

ECONOMY CARS — U. S. MANUFACTURE 1960 MODELS

Use of Die Castings (lbs)

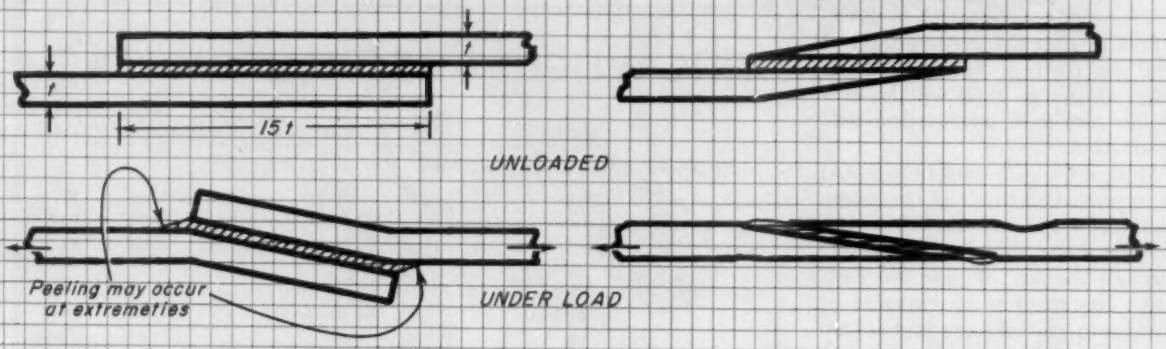
	AMERICAN	LARK	CORVAIR	FALCON	VALIANT
Exterior — Handles, frames, trim	14.00	13.75	3.75	2.50	7.10
Interior — Handles, frames, trim	6.00	10.75	11.00	5.25	5.70
Functional	3.75	3.00	13.00	3.75	3.86
Total	23.75	27.50	27.75	11.50	16.66

* *F — Functional; F-D — Functional-Decorative; D — Decorative*

(Table courtesy of American Zinc Institute)

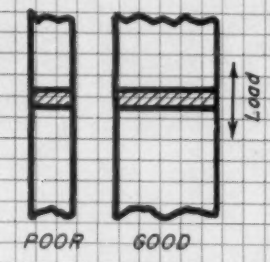
use these PMM **Design Tips** for lower costs -better products

Types of joints for adhesive bonding of metal-to-metal or metal-to-nonmetal.



Plain lap joint has limited strength

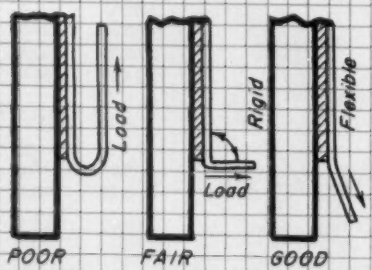
Tapered edges improve stress distribution



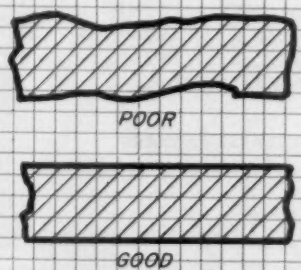
Bonded area should be large enough

Single lap joint design

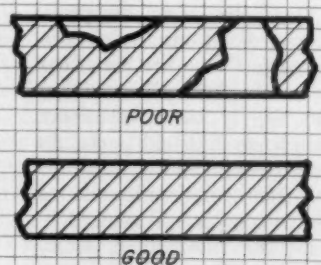
Double lap joint design



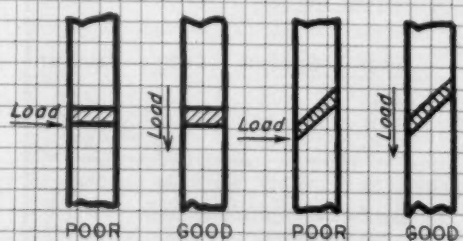
Avoid large peel force



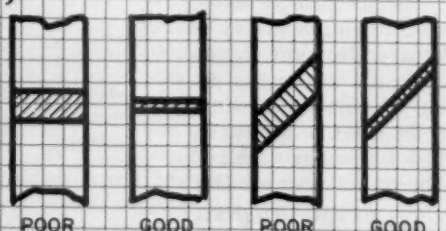
Uniformity in thickness necessary



Avoid starved joint



Stress application



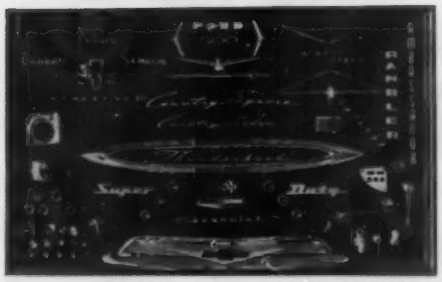
Make adhesive layer as thin as possible

COURTESY "HANDBOOK OF FASTENING AND JOINING OF METAL PARTS," MC GRAW-HILL

50 million castings a year from these

PUTTING THE NEW CARS IN TRIM FOR READY SALES

At TRILEX MANUFACTURING CO., Wayne, Mich., this efficient battery of 14 KUX Hot Chamber Die Casting Machines (400- and 600-ton) is part of the complete Trilex facilities for modern die casting, fully automatic plating, finishing, and assembling.



KUX die casting machines

"THE PRIMARY concern of the major automobile manufacturers for die-cast trim parts is *quality*," says John Airey, president of Trilex Manufacturing Co., important suppliers in the automotive and appliance field. "That's why we have used KUX Die Casting Machines since 1945. They produce hardware finish quality castings.

"But along with quality," Mr. Airey continues, "auto makers as well as appliance men consider *price*. We've found that KUX machines can be depended on for minimum maintenance and minimum downtime. They put us in a better position to compete on a cost-per-unit basis."

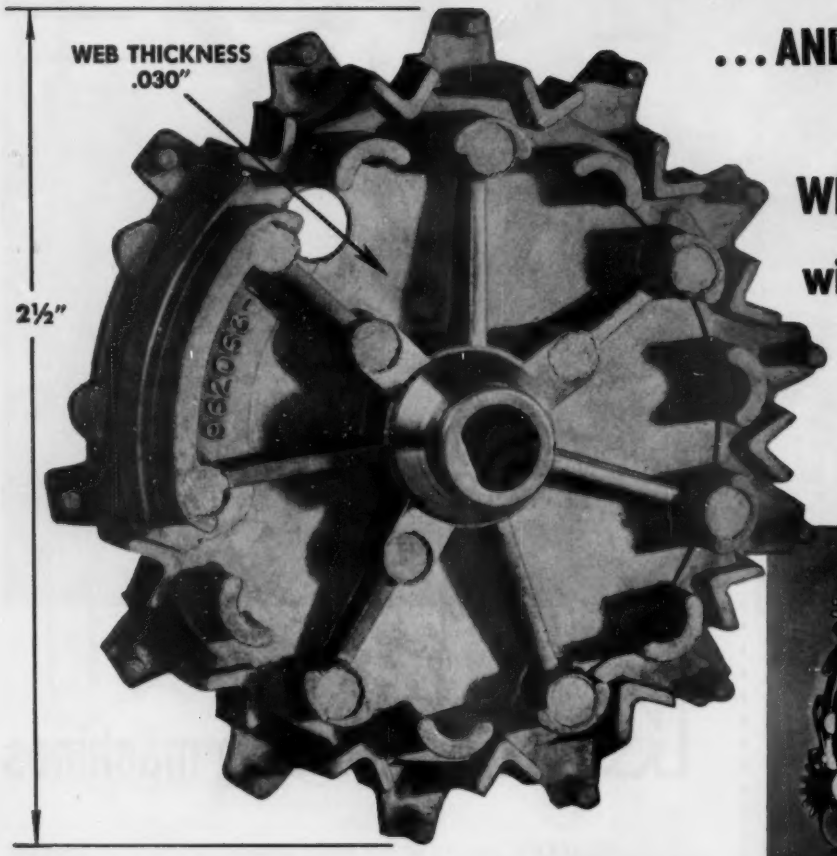
Whether your main concern is lower production costs, higher quality or both, investigate the advantages of KUX Die Casting Machines. 28 all-new strain gauge proven KUX models, 50 to 2000 tons, for both hot or cold chamber operation, available with automatic cycling mechanism and KUX patented "Vac-U-Die" and "Auto Feed" systems of vacuum die casting.

Write for full details of the 28 all-new KUX models illustrated in the latest KUX Die Casting Machine Catalog.

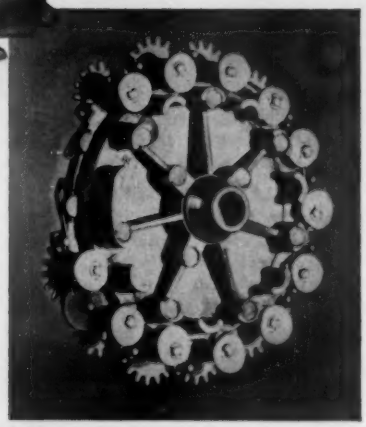
KUX MACHINE CO.
6725 North Ridge Avenue, Chicago 26, Illinois

Circle No. 33 on Reader Service Card

IT'S LIGHTER THAN YOU THINK!



...AND UNBELIEVABLY PRECISE WHEN DIE CAST with ZAMAK



- ONE READY-FOR-ASSEMBLY ZINC DIE CASTING
- ELIMINATES COST OF SUB-ASSEMBLIES
- NOTHING TO WORK LOOSE — TROUBLE-FREE OPERATION
- RUGGED, EXTREMELY THIN WALL SECTIONS — *POSSIBLE ONLY WITH ZINC*

Precision engineered for RCA Victor television receivers, this complex, one-piece ZINC die casting is quickly assembled with gears and cams for locking each channel in fine-tuned position.

HORSE HEAD® SPECIAL ZINC AND HORSE HEAD ZAMAK ARE PRODUCED BY

THE NEW JERSEY ZINC COMPANY

DEVELOPERS OF THE ONLY STANDARD ZINC DIE CASTING ALLOYS IN USE TODAY

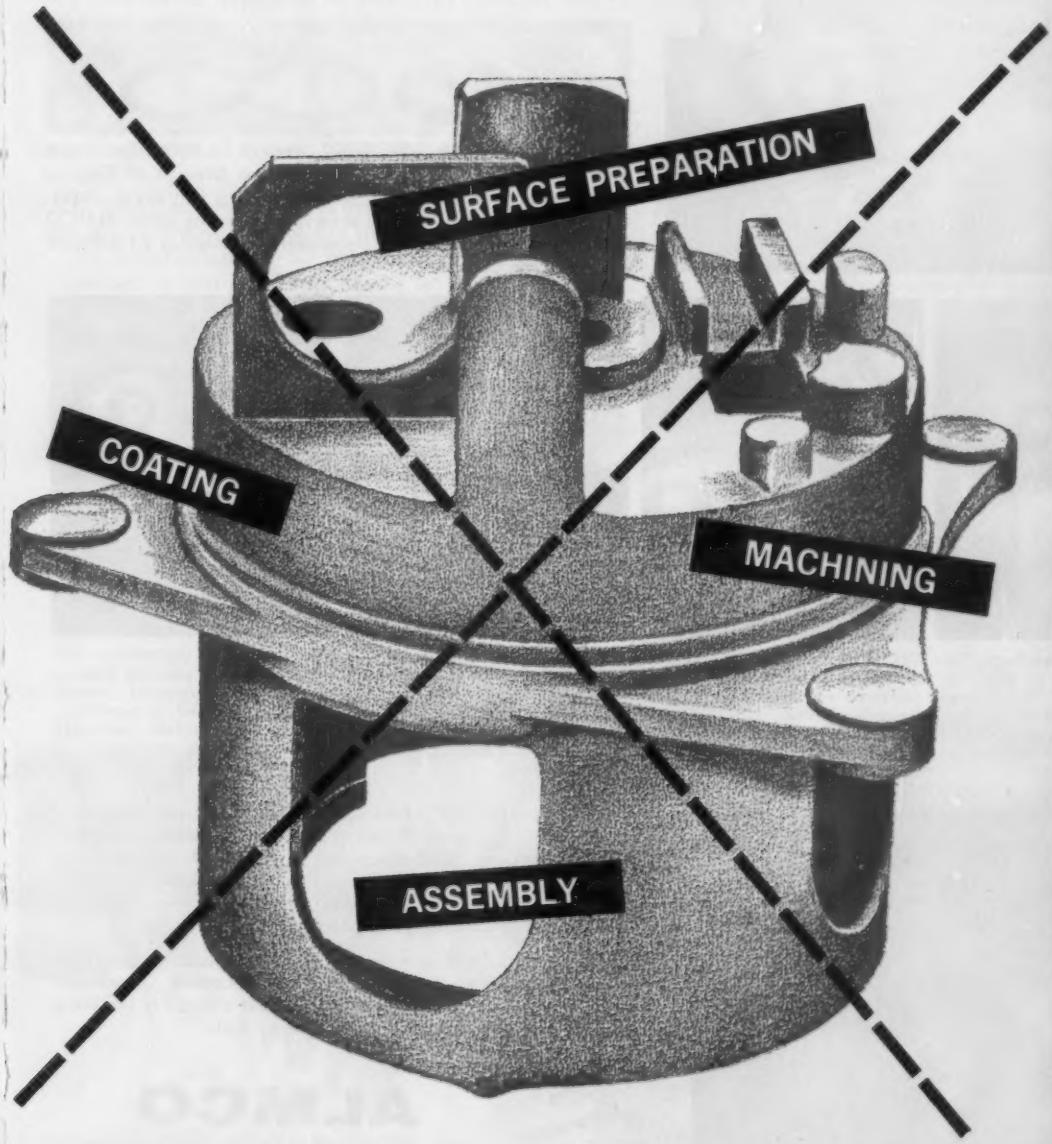
160 Front Street · New York 38, N. Y.

HORSE HEAD PRODUCTS ®

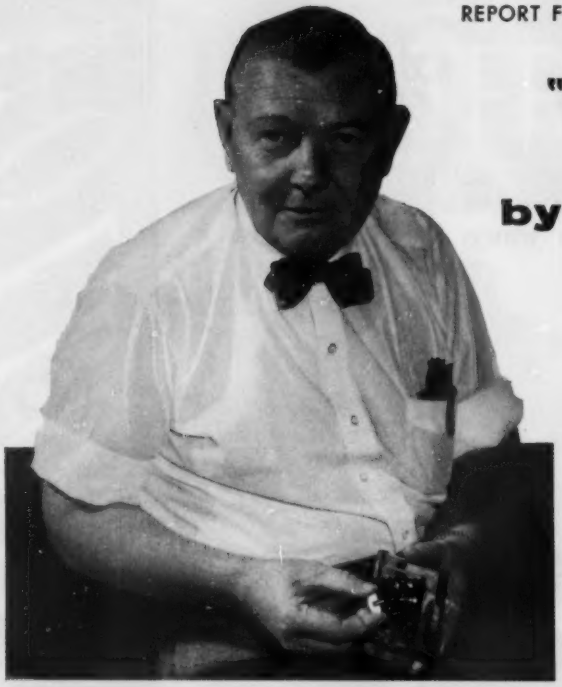
Circle No. 40 on Reader Service Card

FINISHING SECTION

PMM THE SPECIALIZED FINISHING METHODS, EQUIPMENT, AND MATERIALS USED TO MACHINE, ASSEMBLE, SURFACE CONDITION OR SURFACE COAT PRECISION METAL MOLDED PARTS ARE PRESENTED HERE. THIS INCLUDES ALL SECONDARY OPERATIONS WHICH CONVERT A RAW CASTING TO A FINISHED PRODUCT.



REPORT FROM WESTCLOX • *Division of General Time Corporation*



"Here's how we save $46,464 annually by deburring clock parts with ALMCO BARREL FINISHING EQUIPMENT."

"MY NAME IS A. R. BIERBRODT. Here at La Salle, Illinois, I'm Supt. of Metal Finishing for the Westclox Division of General Time Corporation, makers of the famous Big Ben alarm clocks. I'd like to show you how we save big money by using ALMCO barrel finishing machines for deburring and finishing 24 different clock parts in our plant."

(1) "Here, John Chambers lifts the hood of one of our 10 ALMCO machines. We figure we save $46,464 annually by deburring and finishing clock parts with ALMCO barrel finishing equipment."

(2) "Parts to be finished are added to predetermined proportions of media and compounds. A total of 10,000 cast gear wheels, for example, can be deburred and finished in one hour's time."

(3) "Lock 'er up and we're ready to go. Previously, when these clock parts were deburred and finished with power tools, only 3,500 parts were finished during an 8-hour work period."

(4) "A flip of the switch and the precision process begins. Burrs are removed, rough edges smoothed to specifications, and 80,000 perfectly finished parts delivered to production lines each day."

(5) "Here, Harry House, Foreman, inspects clock parts finished by ALMCO Supersheen equipment and methods. Barrel finishing has given us a daily labor saving of $193. What's more, quality and uniformity are good and production is way up. Results are truly outstanding."

LEARN HOW MODERN BARREL FINISHING can improve your product! The facilities of ALMCO's new technician-staffed lab in Albert Lea, Minnesota, are available to you without obligation. Send your sample parts with specifications desired or write on your company letterhead requesting an ALMCO engineer to visit your plant.

SEND FOR YOUR FREE barrel finishing handbook. 52 pages of case history facts and barrel finishing processes. Illustrated equipment section. Includes detailed cost chart on finishing of typical parts. Send for your free copy today!

ALMCO

Queen Products Division / King-Seeley Corporation
73 E. Main St. • Albert Lea, Minnesota

Sales Engineering Offices in Chicago, Detroit, Los Angeles, Newark, New Haven and Philadelphia.

IN ENGLAND: *Almco Division of Great Britain, Ltd., Hitchin, Herts, England.*

Circle No. 90 on Reader Service Card

MACHINING THE CORVAIR CYLINDER HEAD

BECAUSE IT'S AN aluminum die casting instead of a cast iron sand casting, the cylinder head of the new Corvair is machined in less than one-half the time and with less than one-half the operations.

But the shift to an aluminum die casting didn't mean that new machine tools had to be designed and built. The Buhr Machine Tool Co., who built the transfer machines used to finish the heads, used standard components. They are a bit more compact than would be used for cast iron heads, but the reduction in machine size is nowhere near in proportion to the smaller size and lower weight of the new engine.

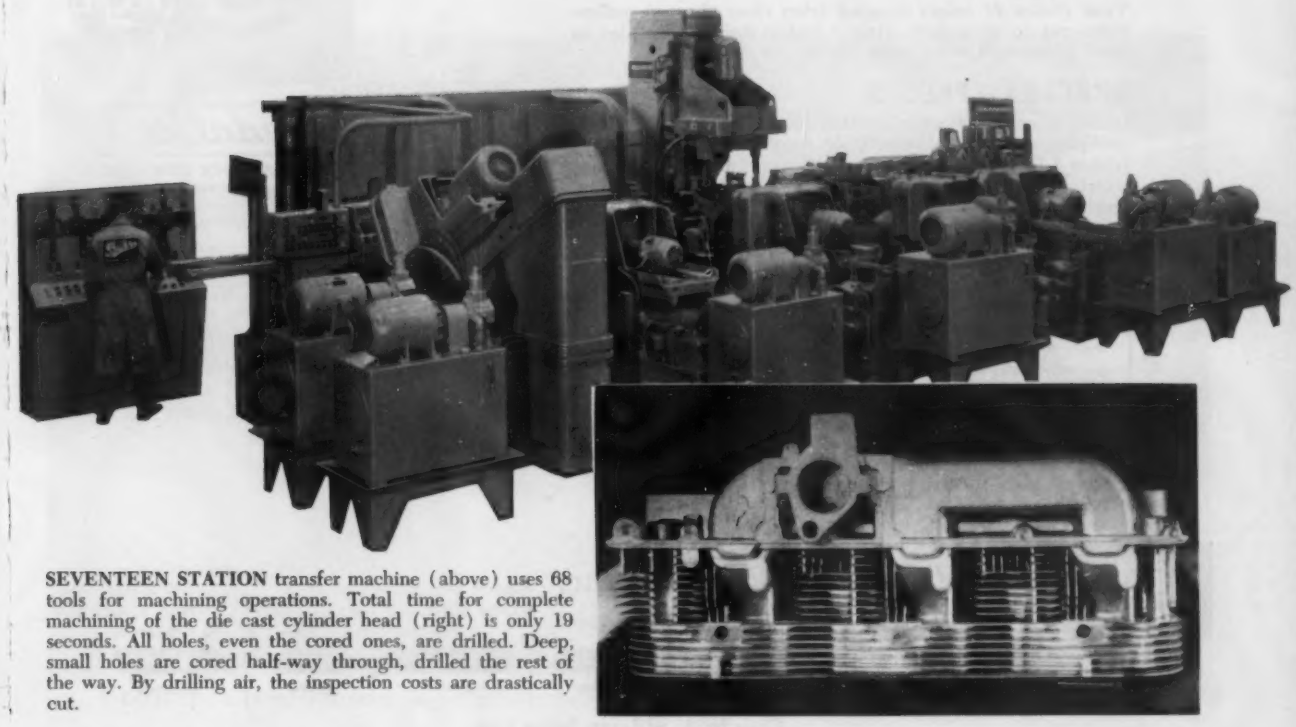
The transfer unit has 17 working and idle stations. These are in two groups separated by a 90° turn. In all, 68 operations are performed by 68 separate tools. Operations consist of drilling, chamfering, boring, reaming, and tapping. Milling operations have been eliminated. A complete machining cycle takes only 19 seconds after a work piece is manually loaded at station no. 1.

Naturally, all possible holes are cored in the casting. Small diameter, deep holes are cored about half way through the casting and drilled the rest of the way. A feature of the machine is that it drills air in many cases. Drills are run through all cored holes even though no metal is removed. This does not increase the cost of machining and does decrease inspection costs. If air were not drilled, a 100% inspection of all holes to be tapped would have to be made.

Because the transfer machine uses standard components, it is considerably over powered. This permits operation at much higher speeds and feeds than would otherwise be the case.

All of the tools are specifically designed for cutting aluminum. Drills, for example, have faster spirals and polished flutes. All other types of cutters also have polished flutes.

Gaging is done automatically by the machine with the test results transmitted to the operating console where they can be checked by the operator.



SEVENTEEN STATION transfer machine (above) uses 68 tools for machining operations. Total time for complete machining of the die cast cylinder head (right) is only 19 seconds. All holes, even the cored ones, are drilled. Deep, small holes are cored half-way through, drilled the rest of the way. By drilling air, the inspection costs are drastically cut.

LOOK FOR THE DIAMONDS—SIGN OF FINISHING QUALITY

4 good reasons why you should use IRIDITE®

Chromate Conversion Coatings

ON YOUR ZINC OR CADMIUM PRODUCTS

CORROSION PROTECTION

The wide range of Iridite coatings available gives you a choice of corrosion protection—from economical, mild protection of parts for shipment, storage or display, to extremely high protection under exposure to marine and highly humid atmospheres, gasoline or other hydrocarbons.

PAINT BASE

For an extremely tight bond for either baked or air-dried paints, non-porous Iridite blocks moisture penetration—prevents formation of metallic soap products beneath paint coatings.

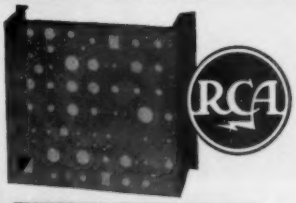
APPEARANCE

Your choice of colors ranging from clear through yellow iridescent to olive drab. Bright Iridite finishes can also be dyed to provide other color effects.

SPECIAL EFFECTS

Iridite, in combination with other Allied Research processes, can provide a wide variety of finishes. As an example, Iridite 8-P applied to zinc or cadmium, followed by an application of Irilac, gives a highly attractive simulated brass finish.

GENERAL ELECTRIC COMPANY



RCA

Medalist
NATIONAL LOCK COMPANY

WEIRTON STEEL COMPANY

IRIDITE—a specialized line of chromate conversion coatings for nonferrous metals. Easily applied at room temperatures with short immersion times, manually or with automatic equipment. Forms a thin film which becomes an integral part of the metal. Cannot chip, flake or peel. Special equipment, exhaust systems or highly trained personnel not required.

For complete information on Iridite, contact your Allied Field Engineer. He's listed in the yellow pages under "Plating Supplies." Or, write for FREE TECHNICAL DATA FILES.

Allied Research Products, Inc.

4004-06 EAST MONUMENT STREET • BALTIMORE 5, MARYLAND
BRANCH PLANT: 400 MIDLAND AVENUE • DETROIT 3, MICHIGAN
West Coast Licensee for Process Chemicals: L. H. Butcher Co.

Chemical and Electro chemical Processes, Anodes, Rectifiers Equipment, and Supplies for Metal Finishing

IRIDITE® Chromates | IRILAC® Coatings | ISOBRITE® Brighteners | ARP® Supplies | WAGNER Equipment

Circle No. 51 on Reader Service Card

DIE CASTINGS

USE BARREL FINISHING BEFORE PLATING

IN RECENT YEARS plating companies have been placing growing emphasis on new, more efficient production methods designed to step up volume, cut operating costs, and improve quality control.

With ever-increasing competition for a share of today's market, it is no longer possible for a company to be content with old methods that may still be doing an average job. A good example of this trend is found in the finishing facilities at the Norwood Electro Plating Company in Brooklyn, New York.

Norwood is producing a wide range of bronze and chrome plating for manufacturers in the decorative cast metal field.

Hand methods of grinding, deburring, descaling, and polishing have all but been eliminated by the installation of the barrel finishing process. Small objects such as ashtray figures, and hardware handles are bulk-processed to produce a surface smooth enough for decorative plating to any degree of finish.

As a job shop catering to the decorating field, no heavy plating such as automobile bumpers, is done. Zinc die castings provide 75% of the plating, the balance are steel and brass.

Mr. Fabber, president of Norwood, said, "Although our history has been one of constant growth, it has only been in the past few years that we have grown into a production operation. Part of this increase in production has been due to improved electro-plating techniques, developed by manufacturers of electroplating equipment, which speeds up current convection.

"However, the addition of precision barrel finishing equipment has opened up an entirely new area of business. Today, we are finishing many items that previously could not be plated because of the high cost of hand polishing and deflashing.

"In the past, skilled immigrant labor provided hand polishers with the stamina to hold the object against the buffer with 40 lbs. of arm pressure. It was hard work, and present day workers won't do it. Every

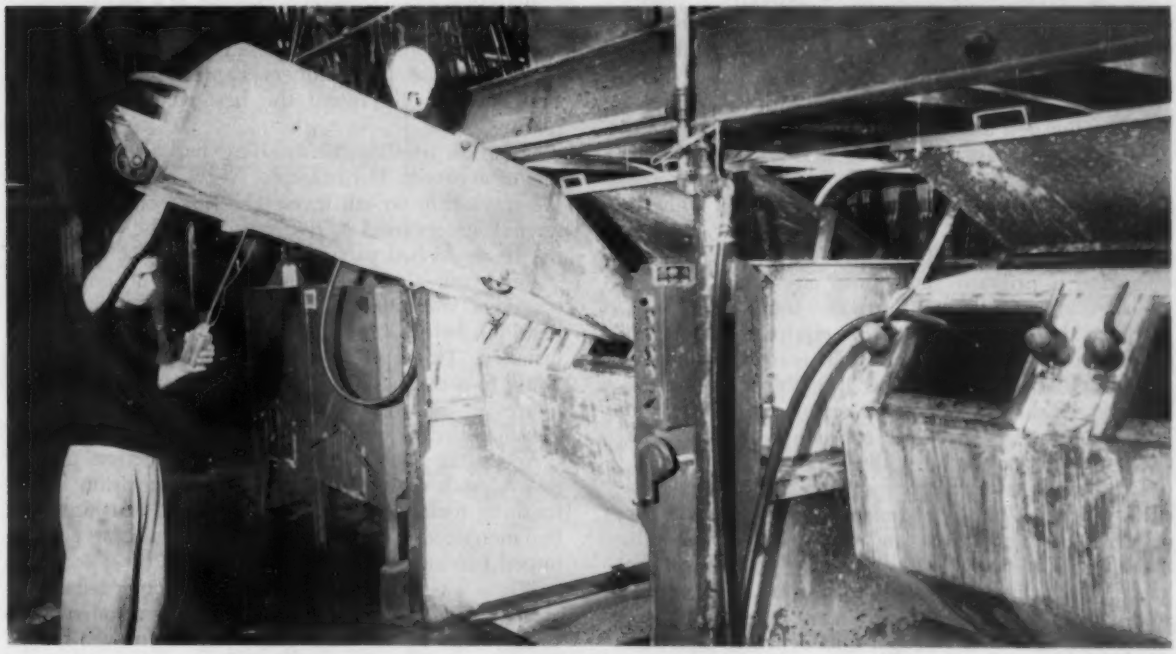


FIG. 1 LOADING a barrel with small die cast parts at the receiving area.

FIG. 2 THE OPERATOR unloads one barrel while the other barrel works.

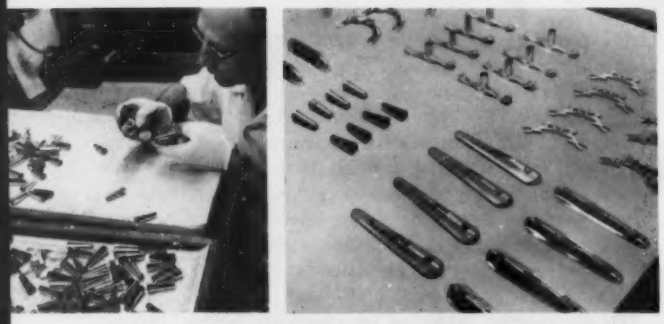


FIG. 4 FINISHED WORK is carefully inspected. Different items before and after plating are shown on the left.

hand polisher in our plant has been with our company for more than 10 years. Today, integrating barrel finishing into the preplate stage gives the customer a choice of several degrees of finish, from a coarse matte finish to a surface smooth enough to plate to any desired luster. The variety of surfaces made possible by precision barrel finishing provides a money savings spread of 25% to 60% over a hand-polished job.

"Barrel finishing also makes possible the combining of plating and hand polishing. As an example, hardware handles, previously polished entirely by hand, are now finished and plated with only the top surface hand polished. Cost reduction was from 10¢ to 6¢ per handle. The differences in finish, between the present method and the old, would be recognized only by an expert.

"We are actually selling labor. As a job shop our operation is primarily labor and any hand polishing we can eliminate will cut down on costs.

"Since the installation of this equipment, our production has increased 20 to 25%. This increase in business would normally require a doubling of our expensive polishing staff. However, all we did was to add an entire second shift consisting of almost entirely unskilled and semi-skilled labor."

The flow of materials to be plated starts at the receiving dock. Work to be finished is taken to the barrel finishing department and is started through the machines. The first step is deburring with the barrel loaded with lime, granite, and water. The second step is the cut-down, which uses Roto-Finish 10S compound and water. Proportions of water and compound used depend upon the nature of the object

FIG. 3 RACKING barrel finished work for plating.

processed and results desired. The last operation is coloring. The parts and chips are then separated by a vibrating separator, rinsed, dried, and sent to plating.

Control factors and operating cycles, depend on the item to be finished, and are set according to Roto-Finish specifications.

Plating procedure follows a U-shaped line with objects to be plated clipped in the plating racks at one end of the U. The usual sequence of operation is: wash, etch, wash, copper-plate, wash, nickel-plate, wash, chromium-plate, wash. The plated objects are then removed from the discharge end of the U, ready to be returned to the manufacturer.

As one of the first companies to chromium-plate in the Brooklyn area, Norwood has built good will by making their experiences along these lines available to manufacturers. Chromium-plating is a tricky process since chromium, in plating, likes to follow smooth flowing lines, and has a tendency to jump square corners. Norwood gladly offers suggestions in product design that will present the best shape for perfect plating.

Precision mechanical finishing has also prevented loss of accounts. For example, Norwood used to plate the trays *only* on ash trays. The small cast birds and animal figures used as decorations on the trays could not be de-flashed profitably.

Removing the flash and cleaning out holes and openings was a tedious, expensive, time-consuming hand job before mechanical deburring equipment was installed. This opened the possibility of the account going to a company that could de-flash and plate the figures at a lower cost. Now these items are profitably handled in bulk lots.

According to Mr. Fabber, "In production plating many hands make high costs. When precision barrel finishing took the extra hands out of de-flashing, the two men needed to operate the barrel finishing process upped production 20 to 25%.

"Time was, when a prospective customer asked for a plating job quotation, the bid was a firm one-priced deal. We now ask, 'What grade job do you want, how much do you want to pay?'"

NEW PRODUCTS

continued from page 20

TOOLING PINS

DUNDICK TOOLWORKS, INC. — De-Luxe line of precision pins for core, die set-up and gages have the highest standards of materials and workmanship, yet cost a fraction of comparable pins. Reversible construction allows long life and continuous accuracy.

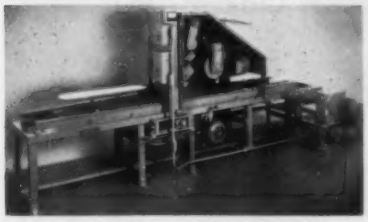
Circle No. 238 on Reader Service Card

SUSPENSION SCALES

W. C. DILLON & CO. — Model P suspension scales are vibration damped and compensate for temperature changes. Available in ranges to 10,000 lbs. An easy adjustment for cancelling sling weight is provided.

Circle No. 239 on Reader Service Card

BELT HEAD



MURRAY-WAY CORP. — A new abrasive belt head for grinding and polishing curved surfaces eliminates belt run-off. Results are closer tolerance, truer shape, and reduced work time.

Circle No. 240 on Reader Service Card

CHARTS SURFACE PROFILES

MICROMETRICAL MFG. CO. — The Rotary Proficorder provides a permanent, greatly magnified chart of surface irregularities and total profiles for curved surfaces. Available in combination with the Linear Proficorder for flat surfaces.

Circle No. 241 on Reader Service Card

IRON AND NICKLE PELLETS

TECHNAMETALS, INC. — Pure iron and nickle catalytic pellets for ammonia dissociators and similar applications are now available.

Circle No. 242 on Reader Service Card

continued on page 64

RANSBURG

What Would Paint Savings Like This* Mean in YOUR Finishing Department?

Quality is all important in the production of fine Metalcraft furniture by George Koch Sons, Inc., Evansville, Indiana.

That's why they use the Ransburg Electrostatic Hand Gun to apply a uniform clear coating on their brass-plated furniture. The protective coating is baked on. Although the bulk of their present production is in the popular brass line, they still paint the metal furniture in a variety of colors with the Hand Gun.

Painting is CLEANER ... QUICKER ... CHEAPER *with the Ransburg Electrostatic Hand Gun.*

These chairs and table are typical of the Koch line of metal furniture.

***10 GALLONS OF PAINT NOW DOES THE JOB WHICH FORMERLY TOOK 30 GALLONS**

On one item—a TV table—they formerly used 30 gallons of enamel to coat 1000 units by combination dip and air spray method. Now—with the Ransburg Electrostatic Hand Gun, they paint 1000 tables with only 10 gallons. And, they get a better, more uniform coating, too.

NO REASON WHY YOU CAN'T DO IT, TOO!

See how the Electrostatic Hand Gun can save time ... paint ... and cut costs in YOUR finishing department. Or, if your production justifies, it'll pay you to investigate Ransburg's automatic electrostatic spray painting equipment. Write for our No. 2 Process brochures which show numerous examples of modern production painting in both large and small plants.

RANSBURG

RANSBURG
Electro-Coating Corp.
Box-23122, Indianapolis 23, Indiana

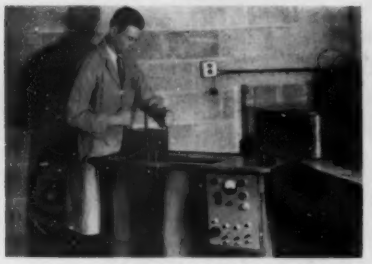
Circle No. 55 on Reader Service Card

METAL CLEANING COMPOUNDS

E. F. HOUGHTON & CO. — The Cerfa-Kleen series of metal cleaning compounds is tailored for hot and cold power washers and soak tanks on a production line basis. The broad range of these four cleaners eliminates confusion and duplication of inventory.

Circle No. 243 on Reader Service Card

ULTRASONIC DEGREASER



BRANSON ULTRASONIC CORP. — Sonogen AC-25 is an ultransonic degreaser which quickly removes all metal chips, grease, and some insoluble soils. The self-contained, compact unit cleans small motors, electronic assemblies, and bearings without dismantling.

Circle No. 244 on Reader Service Card

DEHUMIDIFIER

F. J. STOKES CORP. — Mechanical refrigeration units speed the vacuum plating process. New compact, low-cost units ease the load on vacuum pumps by removing moisture from the air. Unique Stokes features are rapid removal of coil ice and prevention of pressure-burst due to vaporizing ice.

Circle No. 245 on Reader Service Card

ANCHOR NUTS

KAYNAR MFG. CO. — Two new self-locking anchor nuts of proven design offer high torque-out and push-out characteristics for high temperature applications.

Circle No. 246 on Reader Service Card

continued on page 66

For a pre-cleaning short-cut to better plating

ask Oakite

OVER 50 YEARS CLEANING EXPERIENCE • OVER 250 SERVICE MEN • OVER 160 MATERIALS

Now—remove smut, rust and soils with one electrocleaner: Oakite 190

Here is a new reverse-current cleaner that performs two operations at once. (1) It removes the oily soils normally requiring an alkaline cleaner . . . and (2) it removes smut and rust bloom normally requiring additional treatment.

New Oakite 190 performs this double duty because it's a *chelated* detergent. Chelation—which makes metallic salts and oxides soluble in water—handles the removal of smut, heat scale and rust. Powerful alkaline detergency handles the removal of oil films and shop soil. As a bonus, Oakite 190 has high conductivity, rinses well in hot or cold water.

Result: new Oakite 190 insures fewer plating rejects due to inadequate pre-cleaning, *eliminates an entire operating step* in many instances.

For more details about Oakite 190, ask your local Oakite man or write to Oakite Products, Inc., 25A Rector Street, New York 6, N. Y.

it PAYS to ask Oakite

OAKITE

over 50 Est. 1909 SCIENCE

years' leadership in industrial cleaning

Circle No. 54 on Reader Service Card

process for positive, low-cost deburring, grinding, polishing, burnishing, radii-forming, cleaning, descaling, rust removal, stress relief, low micro-inch finishing, and surface hardening of metal parts...

CARBOtrol 7

COST-MINDED MANUFACTURERS will find it profitable to investigate their metal finishing operations and switch to the CARBOTROL 7 barrel finishing process by CARBORUNDUM. For the first time, precision finishing of metal parts can be handled efficiently and economically by most plants to replace costly hand finishing operations. CARBOTROL 7 is adaptable to all manufacturing processes. Parts of intricate shape, fragile and large parts, and those requiring fine finishes can now be processed on a mass production basis with excellent results. A staff of trained specialists and distributors from coast to coast are at your disposal. Sample parts can be processed and proper recommendations given for finishing to absolute specifications. Look into CARBOTROL 7 today!

for a complete, unbiased national service... count on

CARBORUNDUM®

Electro Minerals Division
Dept. PM 83-04
THE CARBORUNDUM COMPANY
Niagara Falls, N. Y.

Please send me your booklet "Carbotrol 7 Process of Precision Barrel Finishing."

Name _____

Title _____

Company _____

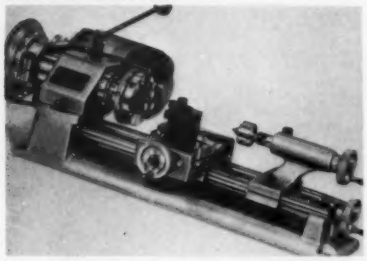
Address _____

City _____ Zone _____ State _____

® 83-04

Circle No. 52 on Reader Service Card

SMALL LATHE



AMERICAN EDELSTAAL INC. — The Unimat is a complete precision machine shop for the tooling of small parts, yet is no bigger than a typewriter. Features easy operation and a selection of accessories.

Circle No. 247 on Reader Service Card

ELECTRIC FURNACES

MECH-TRONIC EQUIPMENT CO. — A new line of electric furnaces with variable speed continuous belts are easy to maintain and have a long element life. The self-contained units are well insulated and have good temperature distribution.

Circle No. 248 on Reader Service Card

FURNACE ACCESSORIES

THERMO ELECTRIC MFG. CO. — New accessories make the Thermolyne Type 2100 electric furnace more versatile. Included are: stainless steel pots and skimmer, parts basket, graphite ladle, and refractory chamber liner and cover.

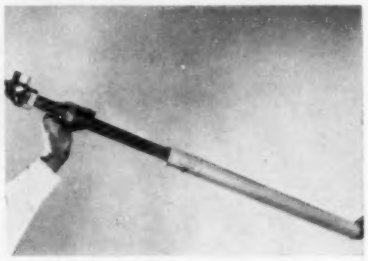
Circle No. 249 on Reader Service Card

ULTRASONIC CLEANING

METACLEAN EQUIPMENT CO. — AutoSonex ultrasonic cleaning and degreasing machine delivers clean and dry metal parts as fast as they come from automatic fabricators. The compact movable units will handle almost all metal parts.

Circle No. 250 on Reader Service Card

THERMOCOUPLE ASSEMBLY



PYROMETER CO. OF AMERICA — The Alodure thermocouple assembly features an immersion tube combining the strength of a metal with the corrosion resistance of a ceramic. Designed primarily for use in molten aluminum, magnesium, and lead.

Circle No. 251 on Reader Service Card

ILLUMINATED MAGNIFIER

STOCKER & YALE, INC. — Clear-Lite Magnifier provides illumination and wide field magnification without color fringes or distortion.

Circle No. 252 on Reader Service Card

FINISHING MACHINE

PRESSURE BLAST MFG. CO. — The Consol-Matic, a new wet blast unit, is designed for the high production rate finishing of small parts. Abrasives as fine as 5000 mesh, positioning devices, and masks can be used.

Circle No. 253 on Reader Service Card

MULTI-RANGE PYROMETER

PYROMETER INSTRUMENT CO. — The Pyro Model DR35 multi-range surface pyrometer features a wide range and high accuracy. Totally enclosed, the meter compensates for changes in room temperature.

Circle No. 254 on Reader Service Card

GRIND...POLISH...DEBURR in one operation with Hammond FLAT FINISHERS

For fast, uniform, economical finishing of flat work such as sheets, bars, strips, stampings and extrusions with one machine, one operator and one pass.

AUTOMATIC AIR TENSIONING: maintains correct tension on abrasive belts and conveyor belt • **VARIABLE SPEED CONVEYOR:** rate of feed is adjustable from 0 to 60 FPM • **WORK HOLDERS:** hold-down rolls, electro-magnetic platen and various types of conveyor belts • **AMMETER CONTROL:** an ammeter for each head allows operator to determine and maintain the polishing pressure necessary for a uniform finish and longer belt life • **V-BELT DRIVE:** allows abrasive belt speed to be changed to suit the work • **MICROMETER DIAL:** controls heads for required depth of cut.

Write for literature today.

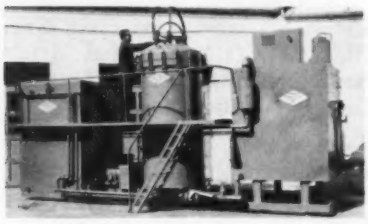
1 TO 6 HEADS
6" to 12" WIDE

Hammond Flat Finishers are available in 6", 8", 10" and 12" widths — handle work up to 6" high

SEND SAMPLES
Send us one finished and several rough samples. You will receive a complete Engineering Report and Production Analysis without obligation.

Hammond Machinery Builders INC.
1642 DOUGLAS AVE. • KALAMAZOO, MICHIGAN
See us at the ASTE Show, Detroit, Booth 1027, April 21-28
Circle No. 75 on Reader Service Card

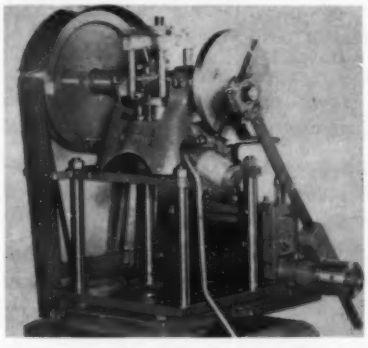
IMPREGNATION MACHINE



PRENCO MFG. CORP. — A batch-type casting impregnation machine for sealing microscopic porosity has central station mounting of all controls and a double ball-check blow back system. New design allows simplified housekeeping, reduction in operator fatigue, and increased operating efficiency. Intended for castings to contain high pressure gas, it can be used without change for any batch-type processing.

Circle No. 255 on Reader Service Card

LARGE BED PRESSES



SALES SERVICE MFG. CO. — Expanded bed HAVIR presses have large die spaces to utilize full press tonnage for die trimming. This eliminates the need for a heavy press just to get a large die space.

Circle No. 256 on Reader Service Card

CENTRIFUGAL CASTING MACHINE

THE CENTRIFUGAL CASTING MACHINE CO. — The Model ML centrifugal casting machine is practically automatic in all operations. In the production of cast iron cylinder liners, the machine requires only one man to remove and replace the end plate on the mold after each cast.

Circle No. 257 on Reader Service Card

TOTES & POURS CRUCIBLES

Developed by MOREHOUSE MACHINE CO., this hand truck will convey and pour crucibles of molten metal. Called Unipour, the unit can be adapted to handle crucibles ranging in size from #40 to #100. It is raised and lowered pneumatically to adjust to varying pouring conditions.

Circle No. 258 on Reader Service Card

MAGNETIC INSPECTION UNIT

Ferroflux is a portable magnetic inspection unit developed by FERRE MACHINE & TOOL CORP. The unit will locate discontinuities through painted or plated surfaces, without damage to the part or danger to the operator.

Circle No. 259 on Reader Service Card

CUTS, ABRADES HARD BRITTLE MATERIAL

The dual version of the S. S. WHITE INDUSTRIAL DIV. Airbrasive unit, the Duplex D, will cut or abrade almost any hard brittle material without shock or heat damage. The unit features added economy, added capacity, and a wide choice of abrasive materials.

Circle No. 260 on Reader Service Card

SPRAY PAINT MASKING DISCS

Kwiky-Dot spray paint masking discs, developed by BY-BUK CO., are overlapped on the rolled release liner for easy accessibility. The discs are high-heat resistant and will release cleanly without adhesive transfer even after baking at temperatures up to 350 F. The discs are available in stock sizes from ⅛" in dia. and increase in increments of 1/16".

Circle No. 261 on Reader Service Card

CLEARING THE WAY FOR PROGRESS

Quality is a Built-in Component. That's why CATERPILLAR TRACTOR CO. has used PREP PRODUCTS continually for 22 years.

METAL CONDITIONING—RUST REMOVING
PHOSPHATING—CONVERSION COATING
PAINT BONDING—CLEANING

You too will get better results with this supreme line!

Write Today for Literature. Give Details!

NEILSON CHEMICAL CO.

Windsor, Ontario — 2330 Gainsboro, Detroit 20 (Ferndale), Michigan — Los Angeles, California

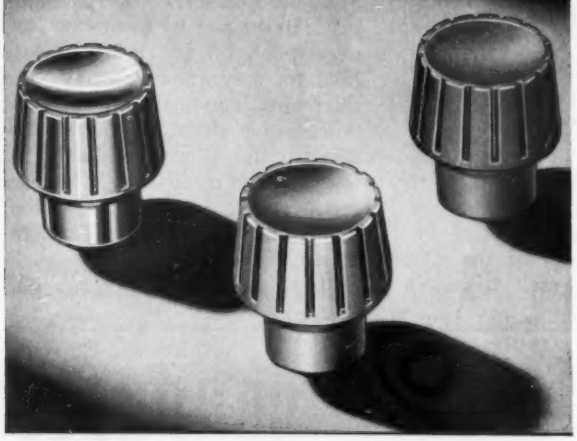
PREP PRODUCTS AND PROCESSES

METALPREP
GALVAPREP
LYFANITE
PHOSTEEM
PREP-N-COTE
EMULSOPREP
STRIP-PREP
RINSEPREP

AND OTHER PREP PRODUCTS FOR STEEL, ALUMINUM, ZINC, CADMIUM, ETC.

Circle No. 83 on Reader Service Card

DURACOAT
..... for Die Castings



CHEMICALLY POLISHED BRIGHT	UNTREATED DULL	PROTECTED GOLDEN COLOR

For chemically polishing, deburring and protecting zinc and aluminum die castings

DURACOAT® DCP-3 and -5. Zinc die cast parts can now be chemically polished by simple immersion. Costly hand or mechanical operations can be eliminated or supplemented with these solutions. Use for reclaiming stripped parts; prior to plating for brighter deposits and increased throwing power into low current density areas, and as a final finish.

CHEMBURR® 3 and 5. For chemically deburring zinc die castings. Eliminates costly mechanical tumbling and hand deburring operations. Internal holes and threaded sections completely deburred and chips removed by simple immersion.

DURACOATS®. Liquid and powdered chromate products for producing bright, irridescent or golden protective finish on zinc die castings. Fast, simple, economical to use. Highest quality at lowest cost.

ALCHROME® #1 and #2. Clear or yellow golden chromate finish for aluminum. Outstanding protection. Can be used to replace anodizing where hardness is not a requirement.

All **DURACOAT®** products meet existing military specifications.

Write for free technical data sheets describing products in detail. Send samples for free processing.

HEATBATH CORPORATION
SPRINGFIELD 1, MASSACHUSETTS
or 701 North Sangamon Street, Chicago 22, Illinois
38 Years of Service to the Heat Treating and Metal Finishing Industry

Circle No. 53 on Reader Service Card

USEFUL LITERATURE *continued from page 10*

172 Non-Ferrous Metals — AMERICAN SMELTING & REFINING CO. — The ASARCO Non-Ferrous Metals Digest Vol. 1 No. 2 contains a story on: "Continuous Castings Cure Specification Headache".

173 Shop Presses — K. R. WILSON, INC. — 12-page bulletin describes hand operated hydraulic shop presses in capacities from 25 to 100 tons.

174 Iron Powder — ALAN WOOD STEEL CO. — 4-page technical data folder describes AW Iron Powder for a variety of applications.

175 Barrel Finishing Media — THE CARBORUNDUM CO. — 36-page technical brochure on a seven-point system for scientifically controlled barrel finishing.

176 Grinding Machine — HEALD MACHINE CO. — 8-page brochure gives the features, applications, and specifications on the Model 273A Universal Internal Grinding machine.

177 Grinder, Polisher — MURRAY-WAY CORP. — 8-page brochure describes Micro-Polish Units for grinding and polishing coils, blanks, sheets, etc.

178 Induction Heating — C. I. HAYES, INC. — 2-page brochure gives complete details on a new high frequency generator induction heating unit.

179 Casting Molds — DETROIT MOLD ENGINEERING CO. — 4-page "DME News" gives technical information on their standard unit mold for die castings dies.

180 Induction Heating — AJAX MAGNETHERMIC CORP. — 8-page booklet gives technical data on a line of induction heaters.

43 Trim Presses — HANNIFIN CO. — Technical literature gives specifications on open gap or column type hydraulic trimming presses.

228 Valves — UNITED AIRCRAFT PRODUCTS, INC. — 8-page technical booklet gives information on the design and selection of valves.

229 Refractories — THE CARBORUNDUM CO. — 7-page technical booklet gives data on 26 new refractory materials highly resistant to abrasive, chemical and nuclear action.

230 Chemical Feeder — ERLEN PRODUCTS CO. — Brochure gives facts on the Chemicator for feeding chemical treatment into circulating water systems.

231 Aluminum — ALUMINUM SMELTERS RESEARCH INSTITUTE — 10-page booklet tells of the aluminum smelter's 30 years of service to American industry.

232 Laboratory Service — SPECTROCHEMICAL LABORATORIES, INC. — 10-page booklet shows facilities for quality control and analytical services.

233 Aluminum Finishing — MITCHELL-BRADFORD CHEMICAL CO. — Technical literature on aluminum etch, smut remover and cleaner.

234 Belt Grinders — THE CARBORUNDUM CO. — "The Abrasives Workshop" Dec. '59 external house organ of Carborundum tells how to save with abrasive belt swing frame grinders.

181 Aluminum Alloys — ALUMINUM COMPANY OF AMERICA — 10-page technical booklet is a guide to the selection of aluminum casting alloys.

FINISHING

182 Gold Plating — SEL-REX CORP. — 6-page technical booklet gives metallurgical properties, operational data and uses for the Autronex gold electroplating.

183 Fasteners — TINNERMAN PRODUCTS, INC. — 17-page brochure shows case histories where costs were cut by using Speed Nut fasteners.

184 Surface Finish — MICROMETRICAL MFG. CO. — 8-page brochure shows various Profilometer combinations for measuring surface roughness.

185 Thread Inserts — HELI-COIL CORP. — Design manuals and catalogs for screw thread and lock inserts.

186 Plating — ENTHONE CORP. — Pocket guide tells how long to plate at various current densities to get the desired thickness.

187 Impression Stamping — ACROMARK CO. — 8-page catalog shows a complete line of marking and numbering machines.

188 Grinding Machines — HEALD MACHINE CO. — 16-page catalog gives design features of Bore-Matic machines and Heald grinding machines.

189 Zinc Plating Brighteners — ALLIED RESEARCH PRODUCTS, INC. — Technical data on Isobrite 354, which produces a white, bright plate directly from the barrel; and Isobrite 355, which produces a bright zinc deposit with a slight yellow cast.

190 Chemical Milling — CHEMICAL CONTOUR CORP. — 12-page booklet on the chemical milling process.

191 Cleaning Abrasives — PANGBORN CORP. — 20-page data book gives facts to consider in selecting steel blast cleaning abrasives.

192 Aluminum Coating — COLONIAL ALLOYS CO. — Technical bulletin describes a coating for aluminum which creates a hard tough barrier film that results in superior corrosion resistance.

193 Magnetic Particle Inspection — HARRY MILLER CORP. — 36-page data booklet describes wet magnetic particle inspection using Immunol 438.

194 Rust Preventative — MITCHELL-BRADFORD CHEMICAL CO. — Data sheet on Composition 15, a rust preventative liquid, added to hot or cold water rinses, for sintered metals and steel.

195 Metal Coatings — NEILSON CHEMICAL CO. — Brochure describes a complete line of products and processes: Rust remover, metal cleaner, phosphate coatings, etc.

Anodizing — REYNOLDS METALS CO. — "Questions and Answers about Anodizing", is a booklet that answers technical questions on anodizing. Write on company letterhead to : Dept. PRD-26, Richmond 18, Va.

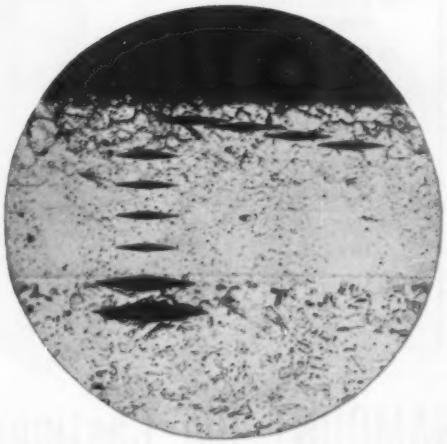
197 Copper Brazing — FABRIFORM METAL PRODUCTS — 24-page technical book gives complete engineering and production information on the controlled atmosphere furnace brazing of copper.

198 Lock Nuts — PALNUT CO. — 20-page catalog presents information on spring tempered steel lock nuts.

So you need a metallurgist...

what's your problem?

METALLOGRAPHY?



Photomicrographs, microhardness studies, failure — corrosion problems and metallurgical investigations covering all phases of ferrous and non-ferrous metal applications are a daily routine in our laboratories.

Metallography is one of our specialties..

Without obligation, send for our brochure and price lists covering complete metal testing and research services. If your problem involves chemical composition, physical-mechanical properties or metallurgical requirements.

Call: LUdlow 8-4161

METAL CONTROL LABORATORIES

INCORPORATED

MCL

2735 E. SLAUSON AVENUE

HUNTINGTON PARK, CALIF.

The Leading Metallurgical Laboratories on the Pacific Coast

Circle No. 91 on Reader Service Card

PARAMOUNT
Die Castings
AT WORK
No. 3 of a Series.

❶ Engine Grille Panel
❷ Carburetor Access Door
❸ Motor Leg Exhaust Cover
❹ Lower Shock Mount Cover
❺ Upper Gear Housing
❻ Lower Gear Housing

PARAMOUNT Die Castings Important on West Bend Outboard Motors

Economy, accuracy, strength and appearance were the factors in the wise choice of aluminum die castings for this sleek 40 H.P. Golden Shark Model by West Bend Aluminum Company.

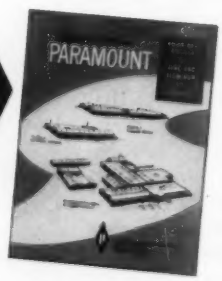
Engineering and production "know-how" were factors in the selection of Paramount to produce these die castings.

Paramount Can Help You, Too . . .

Whatever your product, if there's a die casting in it, or if you're considering re-design for die castings, it will pay you to investigate the complete die casting services available at Paramount Die Casting Co.

Three complete plants—two in St. Joseph, Michigan one in Seymour, Indiana

SEND FOR THIS HELPFUL BROCHURE and "Designing for Die Casting".



RESEARCH PARTICIPANT

PARAMOUNT *Die Casting Co.*
(A subsidiary of TALON, INC.)
ST. JOSEPH, MICHIGAN

Circle No. 42 on Reader Service Card

LETTERS *continued*

PERMANENT MOLD CASTING?

We are currently marketing a pottery glazed novelty jug of unusual shape – like a fish. Size of this jug is 9" high, 5½" wide, 3" thick. Body and tail of this fish jug are curved upwards to fasten to the head thus forming the handle – pouring is done through the open mouth.

Although we have had this on the market but a short time, sales and reaction of the buyers have been very gratifying. In order to further broaden our market we would like to have the jug made of cast, highly-polished aluminum. Can you furnish the names of firms who might be able to make this completed article for us. H.T.Z.

This sounds to us like a good application for permanent mold casting using either a shell core or a plaster core. If the quantities are rather small, plaster mold casting might be used. We have furnished this reader with the names of some foundries we believe will be interested in this type of work. – Ed.

MORE ABOUT LEAKERS

Under Letters, January, 1960, a reader indicates trouble with "leaking die cast bearing plates and gear case covers."

We agree with your reply that without seeing the parts (or the die) it is difficult to guess why the castings leak but we believe the most probable solution to this problem lies in proper control of the temperature of the cavity of the die at the time the shot is made.

Although you mention vacuum as a possible solution, we doubt that this would solve the problem. Vacuum would help remove gases from the cavity, thus assisting in a somewhat better fill, particularly if the die is poorly gated and/or vented.

However, if the die is of the conventional water cooled design and the casting is complex, hot and cool spots on the surface of the cavity will prevent proper, even flow of molten metal into the cavity. Thus, castings with non-uniform molecular structure would result, undoubtedly producing "leakers".

If the nature of the part and

the construction of the die is such that adequate control of temperature of the cavity surface can be provided, castings of uniform, constantly superior quality would result.

We would greatly appreciate being placed in contact with this reader as we are confident we can solve his problem. H.T.S., pres.

A copy of this letter has been forwarded to the writer of the first letter. – Ed.

DIE CAST COPPER

It has recently come to my attention that die casting of electrolytic copper is not an uncommon practice in Europe. We would like to know more about this process. An information would be greatly appreciated.–W. B., Mfg. Eng., Die Cast Dept.

We have referred this inquiry to our correspondent in England, Hiram Barton. Mr. Barton is a well known die casting consultant and is in close touch with all developments in the field in both England and Europe.–Ed.

PLASTER MOLDS

In a course in mechanical engineering, I am studying the manufacture of precision castings in plaster molds. I would appreciate all of the information which you could supply about this process. – M. A., Jr., Univ. of Illinois.

It's encouraging to find that at least one of the leading engineering schools is offering an experimental course in this precision casting process. Naturally, all of the material we have available has been sent.–Ed.

ANODIZING

Please send me any information you have about the English aluminum die casting alloy which is suitable for color anodizing. – R. N. L., Chief Eng.

This alloy is covered by British patent #798,341. The alloy was described in PRECISION METAL MOLDING *in March, 1959.–Ed.*

Circle No. 45 on Reader Service Card

4th in a series of POWDERED METAL PARTS applications by REESE

when SERVICE and KNOW-HOW count as much as ECONOMY

3 Remet Powdered Metal Parts go into Sargent & Greenleaf

FILE CABINET LOCKS

(A) PLUG
(B) FILLER
(C) BOLT

Formerly a zinc base die casting . . . now sintered brass for a higher melting point for use on insulated files.

(A)

According to Mr. George Paul, Chief Engineer, Sargent & Greenleaf, Inc., "A number of powdered metal parts producers were contacted to make these low cost, close tolerance, complex parts. Reese was the only one interested. We now find other practical applications and will, of course, use Reese as our prime source".

(C)

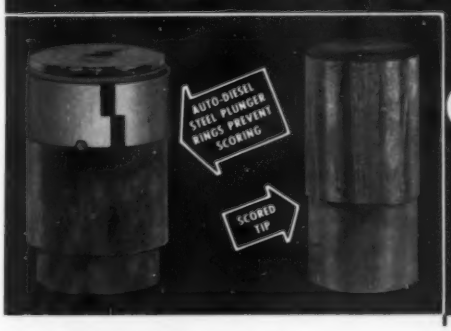
(B)

FREE BROCHURE
"How to Cut Precision Parts Cost with the Remet Powdered Metal Process" shows how the Reese Corp. can help you. Send for your copy today.

Remet
REESE METAL PRODUCTS CORPORATION
537 Howard Ave., Lancaster 10, Penna.

Gears • Pinions • Cams • Ratchets
Oilless Bearings • Bushings • Machine and Structural Parts in
COPPER • BRASS • IRON • ALLOY STEEL • NICKEL SILVER • COPPER INFILTRATED IRON

NEW TIP & RING PLUNGER COMBINATION



6 MONEY SAVING ADVANTAGES

1. Longer wear
2. Denser castings
3. Eliminates aluminum pick-up on sleeves
4. Reduces tip changing down-time
5. Eliminates buying or making new tips
6. You can salvage and use your old tips

Greater Efficiency

Solves problem of scored or worn tips—saving thousands of dollars per year for the die casting industry.

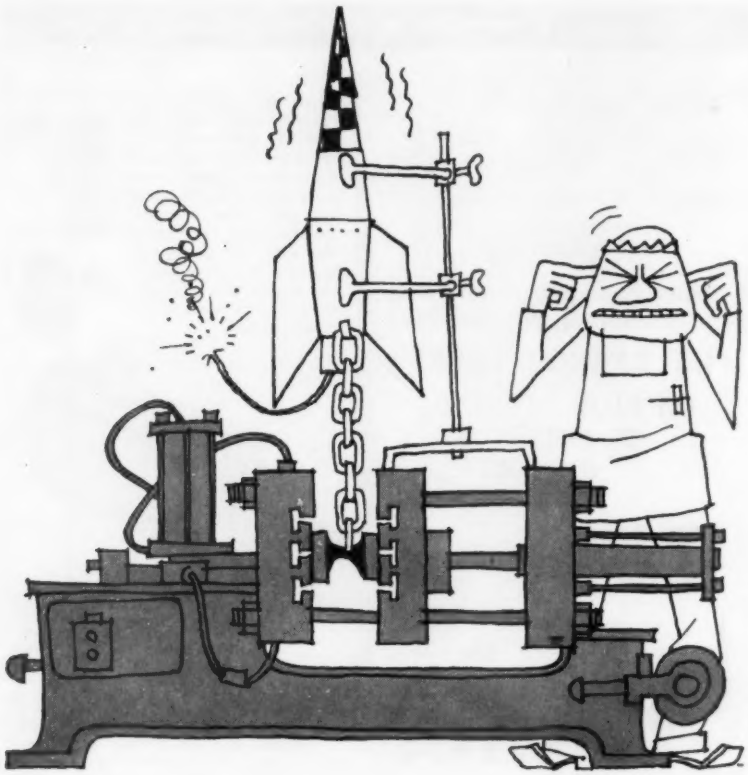
Beryllium copper and steel plunger rings on piston tips result in maximum service life.

Catalog on Request

Plus—Auto-Diesel now offers stainless steel liners for goosenecks—increasing present life 4 to 1—literature on request.

THE AUTO-DIESEL PISTON RING CO.
3141 Superior Avenue • Cleveland 14, Ohio

Circle No. 10 on Reader Service Card



Don't countdown stuck castings...use Die Slick!

If you want to achieve virtually continuous die casting production, you should investigate these two Die Slick compounds: Die Slick No. 9X, for zinc, thins with water to keep your machine ejecting clean castings shot after shot. Die Slick No. 44, for aluminum, thins with water or solvent to eliminate stuck castings, scoring and soldering. Both can be used in a spray gun—and because they thin with water there's almost no smoke.

Water-thinned Die Slick saves you money in several ways. First, you don't need expensive thinners. Second, you eliminate the fire hazard. Third, you save storage space. Send for a trial quantity today... either No. 9X for zinc or No. 44 for aluminum. If you don't like it, you don't pay for it, of course.

Die Slick is a registered trade mark of G. W. Smith & Sons, Inc.

for 20 years

DIE SLICK

used by die casters everywhere

G. W. SMITH & SONS, INC.,

1703 SPAULDING ROAD, DAYTON 32, OHIO

Circle No. 71 on Reader Service Card

HARVEY BEGINS RESEARCH ON REFRACTORY METALS

At the Wright Air Development Center, a contract between the Materials Laboratory and Harvey Aluminum is under way to explore the basic parameters for the fabricability of refractory alloys, i.e., molybdenum, tungsten, niobium, and tantalum.

Harvey Aluminum, operating the Wright Air Development Center metals processing facility, is now studying the metal working characteristics of molybdenum and tungsten.

To solve the high temperature problems concerned with propulsion and re-entry, a shift to materials having a high melting point and increased high temperature capability is necessary. Before material specifications can be established, environmental conditions must be defined and design criteria and fabrication methods established.

The Wright Air Development Center metals processing facility was established to accelerate the Air Force refractory alloy development program and joint programs with other governmental agencies and their contractors. The basic equipment operated by Harvey Aluminum consists of: a 700 ton high-speed, horizontal extrusion press; a 600 ton high-speed, vertical forging press; a 3500°F induction billet heating station; and other auxiliary furnaces and tools.

Approximately twenty unalloyed molybdenum and thirty molybdenum alloy billets have been successfully extruded to date. The experimental extrusion of 50% Mo—50% W and unalloyed tungsten (sintered products) has been accomplished with a reasonable degree of success at a 4:1 extrusion ratio. The molybdenum alloys extruded to date include:

Mo + .5% Ti
Mo + .5% Ti + .08% Zr
Mo + 1.5% Nb + .026% C
Mo + .5% Zr + .04% C

Significant progress has been achieved with the above alloys and it is felt that experience gained to date will permit the successful extrusion of the "tougher" molybdenum alloys that have presented a serious problem in molybdenum alloy development work.

NEW SHAW PROCESS FOUNDRY

Plans have been completed for a new plant at Detroit Gray Iron and Steel Foundries, Inc. The new facility will use the Shaw process of casting for the manufacture of precision iron and steel dies and castings. In addition, the new plant will be able to supply precision castings, particularly in larger sizes, for defense and industrial use.

FINKL CO. ELECTS NEW VICE PRESIDENT

C. W. FINKL

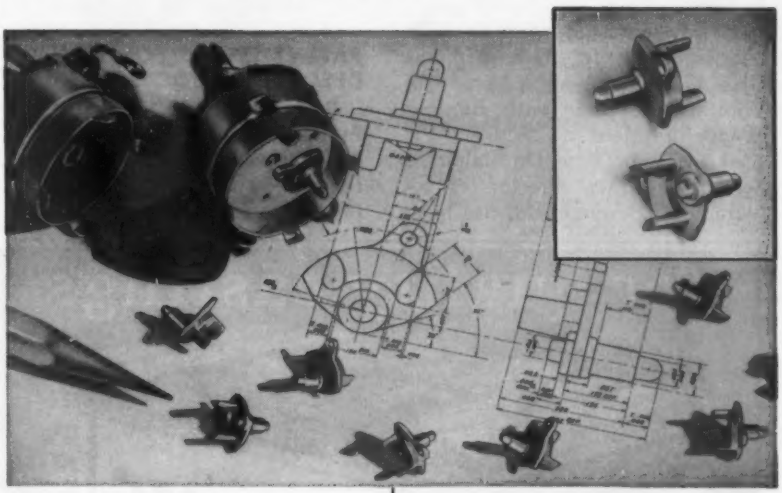
The new vice president in charge of operations and engineering for A. Finkl & Sons Co. is Charles W. Finkl. Prior to his election as vice president Finkl was in charge of engineering and research. In his new position he will continue direction of this work.

Finkl is credited with important engineering contributions to the vacuum degassing process employed by the company. In this process molten steel is vacuum degassed in the ladle. The reduction in hydrogen content of degassed steel is credited with curing one of the major causes of cracking of nickel alloy steels for die blocks and machined forgings.

IBEC BUILDS NEW PLANT

A new manufacturing and assembly plant in West Memphis, Ark., will be built by THE BELLOWS CO., VALVAIR CORP., and SINCLAIR-COLLINS VALVE CO. The companies, which comprise the FLUID POWER DIVISIONS of INTERNATIONAL BASIC ECONOMY CORP., produce pneumatic, hydraulic, and electrical components.

ACCURACY OF TINY GRC DIE CAST PART AIDS MALLORY SWITCH DESIGN



Washer base wing and cap nuts in die cast zinc alloy now cataloged by GRC

Save inventory, assembly time, and labor, with these wide-diameter washer base nuts. Eliminate separate washers. GRC offers prompt delivery from stock in a complete range of 14 thread sizes: #6 through 3/8". Specially suited for oversize bolt holes, adjusting slots, soft surfaces.

Nylon Nuts added to GRC's line of Nylon Screws

Now available from stock: nylon hex nuts in ten sizes—#2 through 5/16". Nuts are single chamfered, washer-faced, double countersunk. Make the most of nylon's outstanding properties — high strength to weight ratio, excellent insulation, resiliency, resistance to abrasion, chemicals, corrosion, etc. See how these new nylon nuts complement GRC's extensive line of nylon screws. Samples sent immediately.

Yours for the asking — GRC handy guide to low cost quality fasteners

25 years of progress in tiny parts

Uniformity and detail of actuator contours essential to proper functioning of special switch

A difficult parts design problem was solved with this tiny GRC die cast zinc alloy actuator which forms the basis of the Mallory OAC Line Switch for radios, television sets, record players and electronic equipment.

In a series of designs that started with a stamping and a screw machine piece involving multiple part assembly, Mallory engineers sought an actuating mechanism for a switch that would be capable of higher rating, longer life and greater dependability than switches using current-carrying springs. Such a control would require exceptional tolerances and critical dimensions to function properly. Uniformity would have to be assured as some of the contours couldn't be subjected to normal inspection procedures.

They found the answer in Gries' exclusive patented methods for the precise automatic production of tiny parts, and literally designed the switch around the GRC die casting.

Uniformly accurate, well within critical tolerances and solidly durable, this GRC actuator makes possible the simplest of switch construction.

This is just one of the many instances in which Gries' ingenious methods have opened the door for new products—at substantial savings. Parts are delivered ready for use . . . assembly and other secondary operations are eliminated.

For more information ask for the GRC bulletins on small zinc alloy die castings and molded plastic parts or send prints for immediate quotations. Maximum sizes 1¾" long, ½ oz. in zinc alloy; 1¼" long, .03 oz. in plastic. No size too small.

WORLD'S FOREMOST PRODUCER OF SMALL DIE CASTINGS

GRIES

GRIES REPRODUCER CORP.

157 Beechwood Ave., New Rochelle, N. Y. • NEw Rochelle 3-8600

Be sure to see GRC at the IRE Show — Booth 4110

Circle No. 25 on Reader Service Card

BUNTING BRASS APPOINTMENT

The Bunting Brass and Bronze Co. has announced the appointment of William H. Searles as treasurer. Searles succeeds Walter F. Volk.

Searles joined Bunting in 1958 after working for Owens-Illinois Glass Co. and Reynolds Metal Co. Volk will continue with Bunting as vice president.

At the same time Dr. Ralph A. Schaefer, former director of research and development, has been named director of an enlarged engineering and research department. David C. Spaulding, now manager of product engineering, will become assistant director of the enlarged department.

PATENT ISSUED FOR NEW DESCALING PROCESS

Patent No. 2,915,444 has recently been issued to Dr. Walter R. Meyer, president of Enthone, Inc., for an electrolytic alkaline descaling and derusting process.

Advantages of the new process are elimination of acid attack on the metal, formation of smut, and the high rate of corrosion to surrounding equipment by acid fumes.

With the new alkaline descaling process iron and steel is cleaned, surface deoxidized, derusted and descaled in one operation. Surface treatment of the metal, prior to plating, can thus be done without the use of any acids.

OLIN ALUMINUM EXPANDS

The purchase of the interest of Textron, Inc. in Almetco, Inc. by Olin Mathieson Chemical Corp. gives that company full ownership of the extrusion facility.

Almetco was formed in 1958 and held jointly by Textron and Olin. It operates an aluminum extrusion plant at Nesquehoning, Pa. No personnel changes at Almetco are contemplated at this time.

In addition to the extrusion plant, Olin operates a rolling mill at Hannibal, Ohio; an extrusion plant at Gulfport, Miss.; and a wire and cable plant at Chattanooga, Tenn. Olin's Roll-Bond products are made at East Alton, Ill.

NEW SALESMAN FOR METAL POWDERS

D. A. THOMAS, JR.

Metals Disintegrating Co. has appointed Donald A. Thomas, Jr. to represent them in metal powder sales in the Buffalo, Akron, Cleveland and Detroit areas.

SWIGERT IS ESCO REP

Henry Swigert has been appointed district sales representative in Arizona and New Mexico for Electric Steel Foundry Co.

for quality castings

Electrolytically refined TADANAC Brand Special High Grade Zinc, is a high quality product that means efficient, trouble-free performance from your casting units. With TADANAC Brand you can be sure of uniform quality, reliable supply and prompt delivery. Further assistance is readily available from our Technical Service Staff, who are fully conversant with the zinc die-casting industry. For your convenience TADANAC Brand Special High Grade slabs have just been re-designed to travel better and handle easier.

When you order zinc specify TADANAC Brand.

COMINCO

THE CONSOLIDATED MINING AND SMELTING COMPANY OF CANADA LIMITED
Toronto WORLD'S LARGEST LEAD-ZINC PRODUCER Montreal

Tadanac Brand Metals are sold in United States by American Metal Climax, Inc., New York, Chicago, Detroit, Los Angeles

0165

Circle No. 18 on Reader Service Card

LAKE ERIE MACHINERY APPOINTMENT

F. P. IAPALUCCI

E. A. Rich, vice president, Lake Erie Machinery Corp., has announced the appointment of Francis P. Iapalucci as plant manager. Prior to his coming with Lake Erie, Iapalucci has been in engineering, manufacturing and sales with Ford Motor Co., Baldwin-Lima-Hamilton Corp., Jackson Products, and Chrysler Corp.

MAGNESIUM ASSOC. RE-ELECTS OFFICERS

The Magnesium Association re-elected these officers at its recent annual meeting: president – Otis Grant, vice president, Magnode Products, Inc.; vice president – Charles Howe, president, Hills-McCanna Co.; vice president – John Thomson, vice president, Dominion Magnesium Ltd.; treasurer – Norman Gzowski, president, Garfield Alloys, Inc.; executive secretary – Jerry Singleton.

RIVETT NAMES BOBBS

RAY BOBBS CO. has been named exclusive distributor in Oregon and Washington for the Rivett Inc. line of air and hydraulic valves, cylinders, and power units.

USCM SALES, EARNINGS UP

Sales of United States Chemical Milling Corp. for the six months ended July 31 were $3.9 million, compared with $2.8 million in the corresponding period of 1958. Earnings after taxes were $269,443, against $189,859 for the same period last year.

This amounts to 56 cents per share, compared with 39 cents per share, adjusted to the present number of shares outstanding.

NAME CHANGE

Consolidated Vacuum Corp. is the new name of Rochester Div., a subsidiary of Consolidated Electrodynamics Corp. The firm produces high vacuum equipment and environmental test apparatus.

WILSON TO HEAD EMERGENCY COMMITTEE

The Emergency Lead-Zinc Committee announced today that Clark L. Wilson of Salt Lake City, Utah, has assumed the Chairmanship of the Committee. He succeeds Miles P. Romney.

Mr. Wilson is Vice President of New Park Mining Company, of Keetley, Utah. He will devote his full time to his new post and will make his headquarters in Washington, D. C.

The Emergency Lead-Zinc Committee represents the interests of over one hundred companies engaged in the mining of lead and zinc in the United States.

CHAIRMAN FOR 1960

Mr. J. A. Goddard, Director and Secretary of Fry's Diecastings Ltd., has been elected Chairman of the Zinc Alloy Die Casters Association (British) for 1960.

FOR COMPLETE DIE CASTING SERVICE

After 30 years of serving the die casting industry we have expanded to offer you complete die casting service.

DESIGN —
Our staff of experienced die casting engineers stay with the job from initial design to finished casting.

DIE CASTING —
Complete facilities to produce castings weighing 14 lbs. zinc.

PLATING —
Plating of all sizes, weights, and types available, from barrel zinc to the most difficult, automobile bumpers.

LABORATORY & INSPECTION FACILITIES —
Our laboratory and inspection facilities is your assurance of quality castings.

DiSalle

The DiSalle Plating & Die Casting Co., Inc.

2851 South Ave.
Toledo 9, Ohio

Circle No. 22 on Reader Service Card

HOWARD FOUNDRY EXPANDS, COMBINES FACILITIES

In a news item in the February issue of PRECISION METAL MOLDING announcement was made that the HOWARD FOUNDRY CO. had closed its Milwaukee investment casting plant. What the article failed to add is that the Milwaukee facilities have been consolidated with Howard's Chicago foundry operations. The company's investment casting facilities are, as a result, substantially expanded.

A company official has confirmed that the move gives Howard an investment casting plant about 25% larger than the old one.

Two new furnaces have been added, one with 50 lb. melting capacity and one 100 lb. capacity. This gives the plant a total of six melting units with capacities from 20 lb. to 300 lb.

The 21-acre foundry houses facilities for casting both ferrous and non-ferrous metals by investment casting, permanent mold casting, sand mold and shell mold casting. It is one of the very few foundries in the country to have this wide selection of foundry processes.

LOCAL BOYS MAKE GOOD WITH LOCAL ZAMAK* USERS

because they give personal service

*also aluminum, bronze, lead, brass, zinc

At HB&S you can

- pick up the phone and get the answer to your question on the spot
- call an order in for same day shipment, in an emergency
- receive palletized delivery to any point within your plant and the many other big little things that help you produce a better product at lower costs.

At HB&S you get big-order, big company attention. Service is individualized to fit your needs . . . specifically engineered to meet your requirements.

See what a difference HB&S service . . . HB&S quality make:

Spectrographic analysis of all production

Alloy number on every ingot

Heat number on every pallet

Start-to-finish quality control for alloys

100% on spec.

And yours for the asking Henning's Pocket Guide to Better Casting

Write TODAY for your copy of "Die Casting with Zinc Base Alloys" explaining the factors influencing the production of sound castings and the causes of faults and defects.

HENNING BROS. & SMITH, INC.

91-117 Scott Ave., at Randolph St., Brooklyn, N. Y.
Telephone: HYacinth 7-3470

- Smelters and refiners of aluminum, bronze, brass, zinc, lead
- Distributors of Olin Prime Aluminum.

Dependable service since 1922

Circle No. 28 on Reader Service Card

LAKE ERIE MACHINERY REOPENS OFFICE

THE LAKE ERIE MACHINERY Corporation of Buffalo, New York has reopened its Detroit District Office and has appointed Mr. Theodore L. Theodorff as District Manager with offices in the Robinson Building, 18450 Livernois Avenue.

This office will serve Detroit and the Eastern half of Michigan, as well as the Western part of Ohio including Cleveland, Cincinnati and Toledo.

APPOINTMENTS AT VESUVIUS CRUCIBLE CO.

Ben R. Shipley formerly assistant sales manager, has been promoted to sales manager of VESUVIUS CRUCIBLE COMPANY, Swissvale, Pa. He will assume full responsibility for the sales promotion of all Vesuvius products.

Crawford B. Murton . . . was appointed Manager of Marketing and Development for Vesuvius Crucible Company. Promoted from sales manager, Mr. Murton's new assignment will include market expansion and product planning and development.

KOEHLER PROMOTED AT H-VW-M

HANSON-VAN WINKLE-MUNNING CO. announced here today the appointment of Henry B. Koehler as Manager Electrical Sales.

In his new position Mr. Koehler is responsible for the sale of all H-VW-M electrical equipment which includes rectifiers, low-voltage D.C. generators, tank and carbon pile rheostats, and the H-VW-M Equaload generator brush.

Prior to joining the company he was with the Public Service Electric and Gas Co. for eight years, serving as a power representative in the company's New Jersey territory. During this period he was primarily concerned with selling power to industrial installations. He has been with the Company since November, 1956.

HARBISON-WALKER APPOINTMENT

Richard P. Snyder has been appointed Manager of Purchasing and Engineering for HARBISON-WALKER REFRACTORIES CO., according to an announcement by E. T. Hile, Vice President.

TWO NEW FINISHING TREATMENTS FOR MAGNESIUM ANNOUNCED BY DOW

Development of two new chemical treatments for magnesium alloys is announced by The Dow Metal Products Company, Division of The Dow Chemical Company.

The new treatments are a ferric nitrate bright pickle, designated Dow 21, and a chrome pickle, designated Dow 20.

The Dow 21 treatment provides a semi-bright to bright silvery finish on magnesium, Dow said. The finish is good for "shelf life" and reduces tarnishing. It can be applied by either dipping or spraying. Clear baking enamels and lacquers can be applied over this finish to protect the bright metallic surface for long service.

Dow said the ferric nitrate bright pickle is applicable to all forms of magnesium and thus can replace both the Dow 15 treatment for wrought alloys and the Dow 16 treatment for castings.

The new Dow 20 treatment is a modification of the standard Dow 1 chrome pickle. Dow 20 was developed for use on magnesium casting alloys with high aluminum content when a more uniform coating is desired. An additional process step is required for successful application.

Like Dow 1, Dow 20 is designed to protect magnesium components during shipment and storage and for use as a paint base. Besides providing a more uniform coating, Dow 20 is less prone to powdering than Dow 1. Corrosion resistance and paint adhesion qualities of the two treatments are similar.

The Dow 20 coating can be caustic bleached to produce bright surfaces. Application of supplementary clear or tinted clear organic coatings will maintain these surfaces for long periods in service, according to the company.

H. P. CROSLAND CHAIRMAN FOR 1960

Brigadier H. P. Crosland, C. B., C. B. E., M. C., T. D., D. L., Chairman and Managing Director of Metal Traders Ltd. has been elected Chairman of the ZINC DEVELOPMENT ASSOCIATION for 1960.

NEW NATIONAL LEAD OFFICER

John B. Henrich has been elected director of National Lead Co. He succeeds James A. Taylor who retired last December.

Henrich is secretary of National Lead Co. and manager of the legal department.

NEW MEMBERS ELECTED TO MPIF

The Witco Chemical Co. has been elected to membership in the Metal Powder Producers Association, a division of the Metal Powder Industries Federation.

Witco manufactures a complete line of metallic stearates. These compounds are widely used as powder and die lubricants in powder metallurgy.

The Manganese Bronze & Brass Co., Ltd., Ipswich, England has been elected to associate membership in the American Powder Metallurgy Institute, a technology division of the Metal Powder Industries Federation.

MAGNESIUM ASSOCIATION MEETINGS ANNOUNCED

Coming meetings of the Magnesium Association have been announced.

Spring Technical Meeting — April 19 and 20, Montgomery and Selma, Ala.

Annual Meeting — May 23 to 31. Landon and Manchester, England and Hannover, Germany. This is a joint meeting with the Magnesium Industry Council of Great Britain.

Annual Convention — October 17 and 18, Cleveland Ohio.

Get more parts per hour with

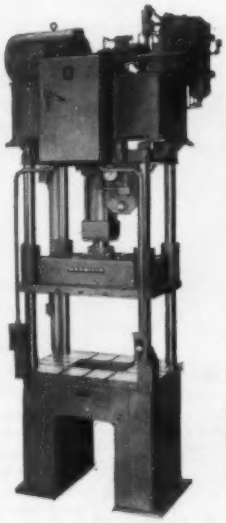
HANNIFIN

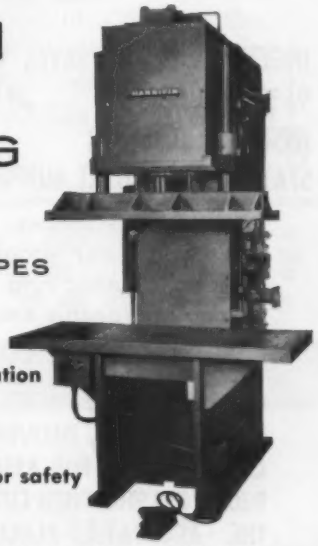
HYDRAULIC

DIE TRIMMING

PRESSES

OPEN GAP OR COLUMN TYPES





- High speed operation
- Easier set-up
- Longer die life
- Complete operator safety
- 2 to 150 tons

Faster Speeds • Lower Prices • Quick Delivery

YOU GET THESE FEATURES:

1. Safe, dual electric (or hand) controls
2. Automatic reverse on pressure or distance (adjustable)
3. Adjustable ram pressure
4. Extra-large tables standard
5. All-steel welded and stress-relieved construction
6. Hardened and chrome-plated rams and guide rods

For the full story of the advantages of high speed hydraulic trimming, send for our Bulletin 142. Or call in your Hannifin representative—he's a trained production analyst.

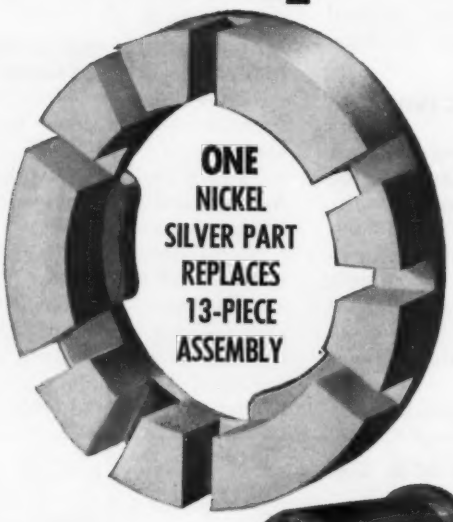
HANNIFIN COMPANY

581 South Wolf Road • Des Plaines, Illinois

A DIVISION OF PARKER-HANNIFIN CORPORATION

Circle No. 43 on Reader Service Card

METAL POWDERS CUT COSTS $1.97 per piece



INGENIOUS DESIGN SAVES 95% AND CUTS ASSEMBLY TIME FOR STATOR WINDING AT MINNEAPOLIS-HONEYWELL

Formerly, 13 pieces were machined from brass bar stock and fitted by hand to a plastic ring to provide contact points for this assembly.

TOTAL COST WAS $2.07

CONVERTING TO NICKEL SILVER POWDER, *ONE PIECE,* DELIVERED BY THE FABRICATOR* READY FOR ASSEMBLY, IS EMBEDDED IN PLASTIC, THEN CUT BACK TO EXPOSE THE ACCURATELY-PLACED TERMINALS — COST 10¢.

*Sintered Metals, Inc., Boston.

← It's New!

"DESIGNING FOR PRESSED BRASS AND NICKEL SILVER METAL POWDER PARTS"

WRITE FOR YOUR COPY — it will give you many valuable suggestions for designing parts to obtain the greatest advantages, including economy, for your products.

THE NEW JERSEY ZINC COMPANY
160 Front Street, New York 38, N. Y.

Circle No. 70 on Reader Service Card

Nowadays even Paul Bunyan could cut more timber with an efficient CHAIN SAW — made really PORTABLE with Lightweight and Tough ALUMINUM and MAGNESIUM DIE CASTINGS

The needs of many manufacturers of portable tools have been solved through having various components die cast in aluminum or magnesium. LITEMETAL has developed real portability so desirable in many of today's tools, including such items as Power Chain Saws, by engineering many of their component parts for die casting in the lightweight magnesium and aluminum alloys. In addition to the important reductions in weight afforded, magnesium and aluminum are tough and give lasting and dependable service.

Several chain saw parts die cast from magnesium and aluminum are shown in the photo above. They are typical applications and include: (1) Drive Pulley, (2) Cylinder Head, (3) Blower Housing, (4) Handle, (5) Gas Tank Cover. Components such as these, when die cast, offer greater scope to the designer; and to the manufacturer, important savings through the virtual elimination of machining, finishing and assembling.

Our expanded facilities now establish LITEMETAL as one of the few companies actively producing die castings from aluminum, magnesium and zinc. Additional facilities offered by LITEMETAL include plating and finishing to hardware standards through affiliated sources, placing at your disposal an integrated time-saving service, coupled with LITEMETAL skill and efficiency.

These symbols are important to you! To better serve our customers, LITEMETAL, through active participation with other die casters in various committees of the American Die Casting Institute, is constantly kept informed of the latest techniques, materials and equipment that are advantageous to the die casting process.

DIE CASTING RESEARCH FOUNDATION PARTICIPANT

Write today for literature and design information. Quick action on inquiries.

LITEMETAL DICAST Inc.
A SUBSIDIARY OF HAYES INDUSTRIES
1925 WILDWOOD AVE. · JACKSON, MICHIGAN
PLANT AND EXECUTIVE OFFICES

Circle No. 35 on Reader Service Card

continued from page 46

TABLE I
THE EFFECT OF VACUUM MELTING ON STEELS

Steel	Hydrogen Content in ppm Air Melted	Vacuum melted
High chromium	6	less than 1
Low alloy	4.5	" " 1
Nickel, chromium, molybdenum	4.5	" " 1
High nickel chromium	5.6	" " 1

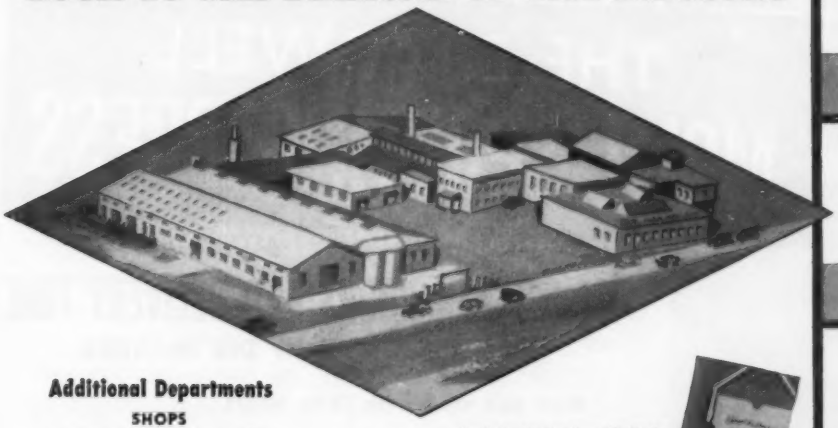
The effect of vacuum melting is to reduce the hydrogen content of the steel very materially. For example, three typical steels melted in air and in vacuum had hydrogen contents as shown in Table I.

Typical fractures of 3.5% Ni, 0.9% Cr, 0.3% C steel free of hydrogen are shown in figure 3a and fractures of high hydrogen content steel of the same composition in figure 3b. All specimens were forged to 1" squares and water quenched. The hydrogen free samples required a relatively deep saw cut to cause fracture. The high hydrogen samples were almost self shattering. This same steel after only light forging and water quenching is shown in figure 4. Figure 4a is the hydrogen free steel which shows no cracking or flaws. Figure 4b is high in hydrogen and shows internal cracking.

The reason for delayed fracture in steels high in hydrogen can easily be understood if a condition such as shown in figures 4 and 5 exists. Vacuum melting helps to eliminate this possibility.

did you know?
1,000,000 AMERICANS ARE ALIVE TODAY CURED OF CANCER
...because five, ten or even twenty years ago they went to their doctors in time! To learn how to guard yourself against cancer, call our nearest office or write to "Cancer" in care of your local post office.
AMERICAN CANCER SOCIETY

For Guaranteed Quality
LOOK TO THE DIAMOND OF THE INDUSTRY



Additional Departments
SHOPS
• Pattern • Machine • Die
FACILITIES
• X-Ray • Laboratory
• Heat Treat • Wheelabrator

Send for the brochure "Behind the Scenes"... complete digest of Hampden Brass's experience, Equipment and Facilities

DIE CASTING
METALS CAST • Aluminum Alloys • Zinc
PERMANENT MOLD
METALS CAST
• Aluminum Alloys • High Purity Alloys
SAND FOUNDRY
METALS CAST • Aluminum Alloys
• High Purity Alloys • Brass • Bronze • Monel
FIBERMOLD DIVISION
High Quality Structural Fiberglas
Modern Vacuum Process

HB
Hampden Brass & Aluminum Company
Established 1903
SPRINGFIELD, MASSACHUSETTS
NON-FERROUS CASTINGS: Sand, Permanent Mold, Die and Structural Fiberglas
Complete Pattern & X-ray Facilities

Circle No. 27 on Reader Service Card

Circle No. 48 on Reader Service Card

SAVE: TIME WORK DOLLARS

on your aluminum alloy casting operations with the

***Stahl* AUTOCAST**

Automatic Permanent Mold Casting Machine

• **PORTABLE...** Both machines can be moved as a unit to different furnaces for casting different alloys.

• **FAST...** Automatic Timer eliminates human error. Dies easily interchanged. Dies need less maintenance of refractory coating.

• **ACCURATE...** Timer has 3-second graduations from 0 to 5 minutes; counter records cycles to 9,999; jog buttons for "inching" mold in either direction.

We can adapt your molds to the AUTOCAST, or make new dies to your specifications.

Send for our technical brochure.

STAHL SPECIALTY CO.
KINGSVILLE, MISSOURI

RARE BOOKS TO MEMORIALIZE WILLIAM H. EISENMAN

Memorial contributions received by the American Society for Metals following the death of William H. Eisenman in May, 1958, will be used to create a collection of rare and important books on metallurgy, honoring the man who for 40 years served as the Metals Society's national secretary. Eisenman was a founder member of the Society, according to Allan Ray Putnam, ASM managing director.

A committee, headed by Dr. Cyril S. Smith, professor at the Institute for the Study of Metals, University of Chicago, will administer the memorial fund and any future contributions, and direct the purchase of the books which will comprise the "William H. Eisenman Collection." The books will be placed in the Society's library at Metals Park, in Novelty, Ohio.

Serving with Dr. Smith on the Committee, by invitation of Walter Crafts, Society president and associate director — technology, Union Carbide Metals Company, Niagara Falls, New York, are J. H. Brennan, Union Carbide Metals Company, Mrs. M. R. Hyslop, managing editor and E. E. Thum, editor in chief of Metal Progress, the Society's monthly magazine.

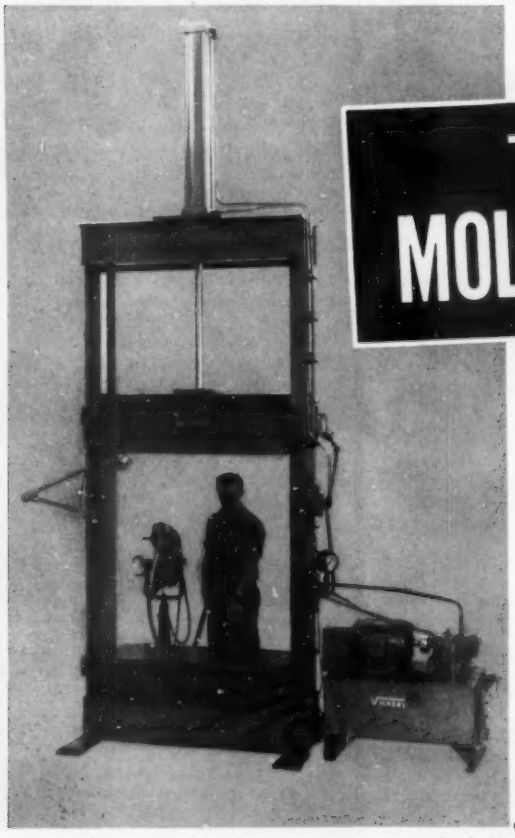
"We hope the Eisenman Collection will become a notable one to which scholars and historians from around the world will turn. Every effort to find and preserve old books on the science of metalworking will be made by the Society and its committee," said Mr. Putnam.

While the William H. Eisenman Collection is just being assembled, its earliest volume is Schreittmann's *Probierbuchlin*, a book on testing printed in 1578.

DENNIS R. HYNES NAMED GENERAL MANAGER

Dennis R. Hynes has been named general manager and director of sales engineering of IFCO, Industrial Furnace Company, a division of AAA Machinery & Equipment Co.

Fred D. Richman, president of AAA, national leader in the used foundry equipment industry, said that Hynes, formerly with Joe Martin Manufacturing Company, Detroit, is expanding IFCO's used heat treat equipment inventory.



THE BRADWELL MOLD SPOTTING PRESS

SAVES MAN HOURS AND DELIVERY TIME
FOR DIE CASTING DIE MAKERS

Now one man with little effort can open and close a heavy die and save his energy for the more important work of fitting.

Send for brochure with complete specifications

THE PALFY DIE & MOLD CO.
2900 BRADWELL AVENUE • CLEVELAND 9, OHIO
SHADYSIDE 9-1979

Circle No. 87 on Reader Service Card

NEW DIE CASTING COMPANY IN BRAZIL

NATIONAL LEAD COMPANY and Companhia Industrial e Comercial Brasmotor of Sao Paulo, Brazil, have formed a company to manufacture die castings for Brazilian markets. The new company, Industrias Doehler do Brasil S. A., has completed the installation of manufacturing equipment and is starting production at its new plant at Sao Bernardo do Campo, an industrial suburb of Sao Paulo. A dedication ceremony will be held at the new die casting facility.

Industrias Doehler do Brasil S. A. will manufacture zinc and aluminum die castings, and will have as a primary market the growing automotive industry of Brazil. In addition, the new company will supply Brazilian manufacturers of appliances and machines with die cast component parts for such diversified products as washing machines, refrigerators, hand tools and business machines.

National Lead Company, a major supplier of die castings to the automotive and appliance industries in the United States, has provided Doehler do Brasil with manufacturing information and technical personnel for the start up of the new operations.

BRITISH LICENSEES APPOINTED BY LOMA-LOBECK

Loma Machine Manufacturing Company, Inc., and its subsidiary, LOBECK CASTING PROCESSES INC., of New York City, have announced the conclusion of a licensing agreement with the Albert Mann Engineering Company, of Basildon, Essex, England.

Under the terms of the agreement, the Mann concern can now offer to the British and West European metal industries the range of high production processing machinery of Loma and Lobeck design, including billet and slab casting equipment, circular sawing machines, continuous rod and tube drawing, straightening and cut-off lines, stretcher levellers, air and hydraulic tube testers and related mechanical handling equipment.

The new agreement extends to the British Commonwealth, exclusive of Canada. and the "Outer Seven" countries of the European Free Trade Assn.

Circle No. 89 on Reader Service Card

Babbitt, Bearing Metals; Lead Products; Solder; Type Metals; Alloys

HYMAN VIENER & SONS

Dept. PMM
P.O. Box 573 • Richmond 5, Va.
Telephone Milton 8-6563

Increase your profits with DFC crucibles & funnels

Since 1876, DFC has furnished crucibles, clay goods, and accessory materials which have set *standards of quality the world over*. More recently the unanimous acceptance and wide use of DFC transfer crucibles and funnels by the precision casting industry, is high testimony to their economy and dependability.

For precision casting...lost wax, investment and permanent mold. Transferring, pouring, spouting... there is a DFC crucible or funnel to meet your exact needs.

If you have a special crucible problem, let us work on it for you.

Denver Fire Clay Company

DENVER • SALT LAKE CITY • NEW YORK

The DENVER FIRE CLAY COMPANY DFO-3
3037 Blake Street, Denver 17, Colorado

Please send me further information on your full line of crucibles.

Name.....
Company.....
Address.....
City and State.....

Circle No. 78 on Reader Service Card

Dodge Custom-made
Special Alloy Steel Goosenecks

. . . for longer service life

. . . less maintenance

Here's the biggest news in die casting in years: a custom-made special alloy *steel* gooseneck that will outlast and outperform iron and alloy iron goosenecks currently available . . . and provide greater operational savings! Developed through years of experience and association with the die castings industry, Dodge Special Alloy *Steel* Goosenecks provide many advantages:

- Will outlast iron and alloy iron goosenecks by as much as 4-5 years.
- Maintenance problems are fewer because of long service life.
- Down time is reduced to a minimum because of long service life.
- Designed and made of special alloy *steel*, they prevent cracking . . . bottom breakout . . . spout erosion.

Each Dodge Special Alloy *Steel* Gooseneck is custom made to specifications by the Finished Products Division of Dodge Steel Company. Facilities are available for producing any size gooseneck for any die casting machine. Goosenecks are furnished either rough machined or machined with sleeves. Dodge provides a complete engineering service in the designing and production of steel goosenecks.

Your inquiries are solicited, without obligation, of course. Ask too, about pots and other die casting machine parts including nozzles, spouts, plungers, etc.

DODGE STEEL COMPANY

FINISHED PRODUCTS DIVISION
6501 Tacony Street
Philadelphia 35, Pa.

THE MOST IMPORTANT ALLOY IN A STEEL CASTING IS QUALITY

Circle No. 23 on Reader Service Card

COMING A.I.M.E. MEETINGS

Two days of metallurgy sessions have been scheduled for the Pacific Northwest Regional Conference, American Institute of Mining, Metallurgical, and Petroleum Engineers, to be held April 28-30, 1960, in the Sheraton Hotel, Portland, Oregon.

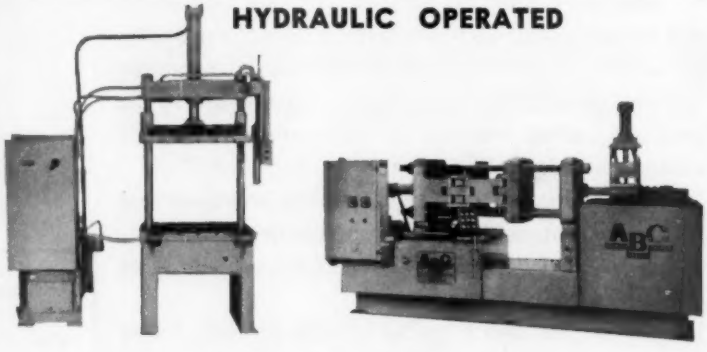
Refractories for the aluminum industry will occupy one session. Three major manufacturers of refractories will present papers at that time. A paper on the new electron-beam melting furnace used in the purification of columbium and tantalum is planned.

The Powder Metallurgy Committee of the Institute of Metals Division, The Metallurgical Society of AIME, is co-sponsor with the Metal Powder Industries Federation of the 1960 International Conference on Powder Metallurgy, to be held in the Biltmore Hotel, New York, June 13-15.

Themes will include a symposium on powder metallurgy fundamentals and theory; theory of solid state sintering; sintering mechanism of titania; sintering behavior of organic materials, interparticle contacts in sintering powders; mechanism of liquid phase sintering; plastic flow model of hot pressing; microhardness in powder metallurgy research; sintering of fine particles produced by calcination; high density sintering of metal powder compacts. Also, sintering with a chemical reaction, as applied to uranium monocarbide; symposium on dispersion strengthening; survey of the powder metallurgy aspect of dispersion strengthened alloy development; theory of dispersion strengthening; dispersed phase hardening in copper; properties of nickel containing dispersed ThO_2; internal oxidation of dilute Ni-Cu alloys for dispersion strengthening. Also, dispersion strengthening steel; symposium on powder metallurgy technology and methods; roll forming of metal powders; hot extrusion of metal powders; hydrostatic pressing of metal powders; slip casting of metal powders; explosive forming of metal powders; lubricants for powder metallurgy parts manufacturing and their influence on prop-

AIR OPERATED

HYDRAULIC OPERATED



Catalog available upon request

ABC DIE CASTING MACHINE COMPANY
400 East 142nd Street Dolton, Illinois

Circle No. 2 on Reader Service Card

"the HITCHINER way..."

allows flexibility in design with INVESTMENT CASTING

This part is a carrier for a stripper on a citrus peeling machine. It is typical of thousands of irregularly shaped components that are designed with only a particular function in mind and no compromise with production limitations. This type of metal part often requires several changes before the design is finalized.

A late design change in this part, cast in 303 stainless steel, incorporated a 45° bevel, top and bottom on both sides of the serrated pad section. The tooling was altered at very little cost while the cost of the finished casting was not increased at all. The relatively low cost of tooling and tooling changes make the investment casting process an economical and flexible method.

Flexibility in design, a wide freedom of choice in alloy and the elimination of expensive machining operations made possible with the investment casting process may help you solve your parts problems. Send us your sample or blueprint and find out with a Hitchiner "engineered quotation" — no obligation.

Find out how our new ceramic shell technique can possibly benefit you. Send for our free, new revised brochure on the latest investment casting methods.

HITCHINER
MANUFACTURING COMPANY INC.
MILFORD 22, NEW HAMPSHIRE

Coast to Coast Engineering Representatives

Circle No. 29 on Reader Service Card

erties; large sintered bodies and parts; symposium on powder metallurgy, materials and applications; refractory powder metallurgy alloys and products; powder metallurgy of refractory materials; heat resisting materials by powder metallurgy; influence of processing and design variables on properties of sintered tungsten-carbide-cobalt alloys. Also, effects of spark erosion on some cemented carbides; properties of hot pressed ultrafine powdered cermets; recent trends in European metal powder parts manufacture; an exploratory investigation of pre-alloyed powders of aluminum; titanium and zirconium powder metallurgy; behavior of lubricant in porous bearings; sintered metallic friction material applications; recent advances in the powder metallurgy of beryllium.

AMERICAN ZINC INSTITUTE 42nd ANNUAL MEETING SET

The American Zinc Institute will hold its 42nd Annual Meeting at the Chase-Park Plaza Hotels in St. Louis, Missouri on Thursday and Friday, April 7 and 8, John L. Kimberley, executive vice president of the Institute reported today.

The first session will be held Thursday morning in conjunction with the Galvanizers Committee of the steel industry and the Lead Industries Association, and will include reports on developments in foreign trade as well as the reaction of foreign producers to the development of world lead and zinc markets, plus a discussion of either labor relations or the general economic situation.

AZI's Thursday afternoon session will include a report on the use of galvanized sheet for prefabricated buildings as well as a detailed progress report of American Zinc Institute's recently accelerated Expanded Research Program.

The third, and final, session scheduled for Friday morning will consist of reports of trends in zinc oxide and brass, die casting, and rolled zinc, and will include a discussion of mining economics.

NATIONAL-U.S. RADIATOR CORP. APPOINTMENT

Herbert F. Korssell has been appointed a sales representative for the Plastic Metals Division of National-U. S. Radiator Corporation.

THOUSANDS OF EXTRA POURS PER LADLE

Less Operator Effort Too!

with

SPINCRAFT LADLES

Light, rugged, Spincraft ladles save replacement costs, make every pouring job easier! Available in a vast range of sizes, in stainless steel as well as mild.

• LIGHT IN WEIGHT LESS FATIGUE!
• NON-SPILL SHAPE NO WASTE!
• EQUIPOISED HANDLE BALANCED!

Write Today for Complete Data and Prices.

Spincraft
SKILL WILL DO IT
INCORPORATED

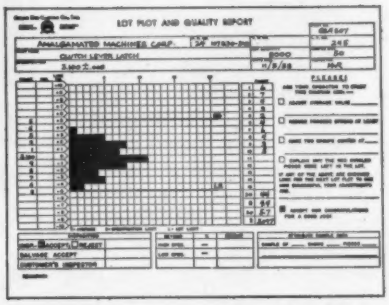
4138 WEST STATE STREET
MILWAUKEE 8, WISCONSIN
Division 2-0730

Circle No. 47 on Reader Service Card

Circle No. 49 on Reader Service Card

STROH INTRODUCES
STATISTICAL QUALITY CONTROL
FOR DIE CASTINGS

DIMENSIONAL CONTROL
AT STROH DIE CASTING
BEGINS WITH A CHART
LIKE THIS . . .



Here's what the new concept of Quality Control at Stroh Die Casting means to you

CRITICAL DIMENSIONS
can be held within specified limits. Buyers who rely on statistical dimensioning to assure accurate parts for assembly are invited to consult Stroh.

LOWER INSPECTION COSTS
come from simpler receiving inspection instead of full sampling of each shipment of die castings. Many manufacturers now benefit from Stroh's Quality Control.

Write for Details

IN OUR 56th YEAR

Stroh Die Casting Co., Inc.

11123 WEST BURLEIGH STREET
MILWAUKEE 10, WISCONSIN

PMM OPPORTUNITIES

jobs & equipment

Opportunities rates: $20 for the first column-inch; $15 for each additional column-inch payable in advance. To answer box number advertisements, address responses to the box at Precision Metal Molding. 812 Huron Rd., Cleveland 15, Ohio. Closing date: 1st day of month preceding publication.

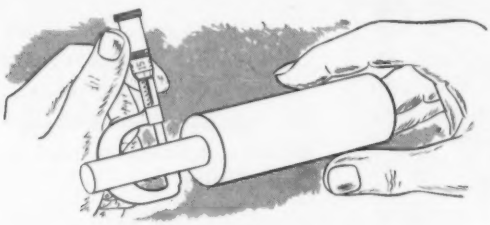
EQUIPMENT WANTED

"Powdered Metal Compacting Presses, 75 Ton and Over in A-1 Condition." Box 3160.

POSITIONS OPEN

POWDER METALLURGY DRAFTSMAN — Experience essential in either design, layout or detailing of tooling for Powder Metallurgy. Salary commensurate with experience. All benefits for pensions, hospitalization, insurance, and vacations. Box 3260.

FOR MORE ACCURATE MACHINING



USE FISKE'S DARL BASE OIL

FISKE'S DARL BASE OIL can be used straight or reduced with mineral oil to exactly suit the work, the tool and the metal. Non-corrosive, works both ferrous and non-ferrous metals. Does not hide the work. Has excellent anti-weld value, lubricity and film strength. An exceptionally effective oil for drawing and stamping, as well as for machining.

FISKE BROTHERS REFINING CO. 90th Anniversary 1848-1938 NEWARK, N.J.-TOLEDO, O.

Send for descriptive bulletin. Write today.

FISKE'S METAL WORKING LUBRICANTS

FISKE BROTHERS REFINING CO.
129D Lockwood Street, Newark 5, N. J.
Plants: Newark 5, N. J. Toledo 5, Ohio
Circle No. 24 on Reader Service Card

COLUMBIA TOOL STEELS

VANADIUM CASTDIE (H13 Hot Work Steel) — the higher vanadium die casting steel that sets performance records

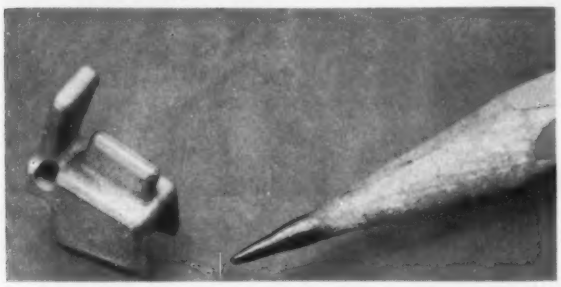
Product of Skilled American Workmen

Circle No. 17 on Reader Service Card

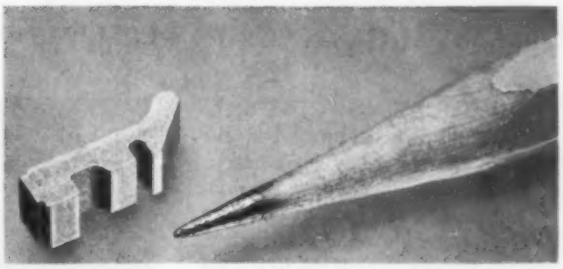
DESIGN FOR THE PMM PROCESSES

WHERE SANITATION'S A MUST

DENTAL TOOLS, like surgical instruments, must be sterilized. This means smooth surfaces and generally not even a plated surface will do. So for this saliva ejector body, stainless steel is used. It used to be



machined, but now it's investment cast in type 302 stainless steel. Polished to a high luster, the surface finishing costs have been cut through the use of a cast part.



CUT COSTS 25 PERCENT

BY SWITCHING from a carbon steel part made from bar stock to an investment casting in high-strength tool steel, the cost of the dog shown above was cut 25%.

The part is used as a component in a quick disconnect coupling for both air and fluid lines.

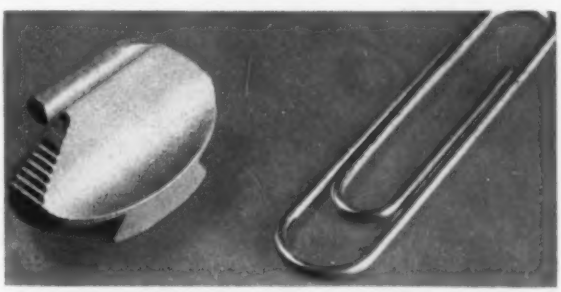
No redesign was required to convert to investment casting as a manufacturing method instead of machining from solid bar stock.

In addition to lowered manufacturing costs, the cast high-strength tool steel gave a better combination of strength and elongation than the older carbon steel component.

An added benefit to the user of the coupling is a much longer service life.

BETTER SIGHTING, LOWER COST

THE FRONT SIGHT on a rifle must stand out clearly, but not cause annoying reflections. That means it has to be black and brilliant at the same time. When it was machined from carbon steel that was hard to get. Now, however, it's investment cast in beryllium copper. The entire piece is easily and cheaply blackened and the bead can then be polished to its natural gold color. So — black and brilliant at the same time; and at a manufacturing cost saving of 15% to 20%.



WANTED - CASE HARDENED, SMOOTH PART

AN ULTRA SMOOTH surface which wouldn't tear cord and a hard wear resistant surface to resist the abrasive action of binder twine are needed on this knotter part. The part used to be forged, machined and then hand finished. Now it's an investment casting in 4615 steel, case hardened. A glance at the old and new parts tells the story, but even more important, the parts are uniform from casting to casting and the cost was cut almost 20%. Hand finishing has been almost eliminated and service life increased since the part has a tough core to resist shock loads.

All parts shown above courtesy Casting Engineers, Inc.

TITANIUM CASTINGS IN PERMANENT MOLDS

HIGH-MELTING-POINT titanium castings can be formed in aluminum molds without picking up surface contamination from attack on the wall by the molten titanium.

The photo shows an as-cast titanium trigger guard, made for the Winchester Arms Co. (right) and a finish-machined, black-anodized aluminum casting (left) poured in the same mold.

The titanium casting was produced by the patented Parlanti Mold Process, which uses an anodized aluminum mold which produces regulated chilling of the molten metal by controlled heat transfer. The casting was poured under high vacuum.

Castings made by this process are claimed to have physical properties that closely approach those of forgings, including high tensile strength and ductility.

Physical properties of the illustrated castings are:

METAL	ULTIMATE TENSILE STRENGTH, PSI	% ELONGATION IN 1 INCH
Aluminum 195, heat treated	62,700	10%
Titanium 6A1-4V, as cast	155,000	3%

FOR LOW INERTIA USES, TRY MAGNESIUM

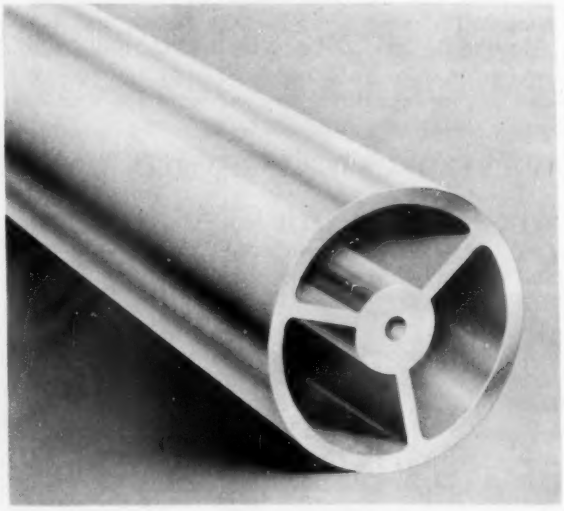
THERE ARE many machine components which must reverse their direction of rotation during operation. Frequently this reversal must be made from relatively high speeds and overshoot in either direction is not permissible. This means then that the rotating member must have very low inertia.

Now if you combine the low inertia required with a smooth surface, suitable for writing on, you have a first class design and production headache. Unless, of course, you use a magnesium extrusion.

The part illustrated is the drum for a recording instrument. It must reverse rapidly and often and hence must have low inertia, and because the record is made on a chart which lays on the drum, the surface must be smooth.

The White Metal Rolling & Stamping Corp. undertook to extrude the section. The ease with which magnesium can be extruded allowed making the hollow shape. Even the center hole for the shaft is formed during extrusion.

Naturally there is some machining to be done after the extrusion is received by White Metal's customer. Here again magnesium has a big advantage. The extruded shape is very easy to machine. In fact, magnesium is probably the easiest common structural metal to machine. Heavy feeds and speeds can be used without danger of tearing the surface, and where necessary a very fine surface can be secured with very little polishing.



An added advantage from extrusion is the relatively low tooling cost, the very small amount of generated scrap from machining, and the ability to get small amounts of extrusions on relatively short notice.

INDEX OF ADVERTISERS

A

A.B.C. Die Casting Machine Co. 82
Acheson Colloids Co. 22
Ajax-Magnethermic Corp. 24
Allegheny-Ludlum Steel Corp. 6
Allied Research Products, Inc. 60
Almco, Queen Products Div. King-Seeley Corp. 58
Aluminum & Magnesium, Inc. 2
Aluminum Smelting & Refining Co. ... Cover II
American Smelting & Refining Co. Federated Metals Div. 31
American Zinc Sales Co. 21
Apex Smelting Co. ..... Cover IV
Auto-Diesel Piston Ring Co. 71

B

B & T Machinery Co. 43
Badger Die Casting Corp. 87
Baldwin-Lima-Hamilton Corp. Industrial Equipment Div. 5
Bethlehem Steel Co. 27
Wm. L. Bonnell Co., Inc. 17

C

Carborundum Co., The Electro Minerals Div. 65
Cast-Master H-P-M Div., Koehring Co. 1
Certified Alloys Co. ..... Cover II
Cleveland Automatic Machine Co. 13
Columbia Tool Steel Co. 84
Consolidated Mining & Smelting Co. of Canada Ltd. 74

D

Denver Fire Clay Co. 81
Detroit Mold Engineering Co. 32
Die Casting "ID" Corp. 87
DiSalle Plating & Die Casting Co. 75
Dodge Steel Co. 82

F

Fiske Bros. Refining Co. 84

G

Gries Reproducer Corp. 73

H

Hampden Brass & Aluminum Co. 79
Hammond Machinery Builders, Inc. 66
Hannifin Co. A Div. of Parker-Hannifin Corp. 77
Heatbath Corp. 68
Henning Bros. & Smith 76
Hitchiner Mfg. Co 83
Hoover Co., The ..... Cover III
Hydraulic Press Mfg. Co. Div. Koehring Co. 1

I

Industrial Equipment Div. Baldwin-Lima-Hamilton Corp. 5
International Minerals & Metals Corp. 90
International Sales Management Co. 19

K

Kux Machine Co. 55

L

Latrobe Die Casting Co. 15
Lester-Phoenix, Inc. 7
Leyden Hydraulics, Inc. 49
Lindberg Engineering Co. 33
Litemetal Diecast, Inc. 78

M

Madison-Kipp Corp. 23
Marvel Engineering Co. 28
Metal Control Laboratories, Inc. 69
Milwaukee Die Casting Co. 89
Misco Precision Casting Co. 11

N

National Lead Co. 9
Neilson Chemical Co. 67
New England Die Casting Co. 34
New Jersey Zinc Co., The 56, 78
New York Air Brake Co., The 4

O

Oakite Products, Inc. 64

P

Palfy Die & Mold Co., The 80
Paramount Die Casting Co. 70
Parker-Hannifin Corp. 77
Pierce-Waller, Inc. 89

R

Ransburg Electro-Coating Corp. 63
Reese Metal Products Corp. 71
Republic Steel Corp. 14

S

R. O. Schulz Co. 88
Sherritt Gordon Mines Ltd. 16
Smith & Sons, Inc., G. W. 72
Spincraft, Inc. 83
Stahl Specialty Co. 80
Stroh Die Casting Co., Inc. 84

T

A. Triulzi 8

U

Union Carbide Chemicals Co. 26
Universal-Cyclops Steel Corp. 29

V

Vascoloy-Ramet Corp. 18
Hyman Viener & Sons 81

W

West Instrument Corp. 30

A WINNING COMBINATION for your DIE CASTINGS

EXPERIENCE —

is the first prerequisite for quality die castings. Our staff of expert designers, engineers and production men have the know how and experience of over 31 years in the industry to save you money while turning out top quality castings.

GUARANTEED QUALITY —

As a licensed producer of die castings under the Certified Zinc Alloy Plan, you can be sure that your zinc castings conform to the strict chemical composition limits for maximum mechanical and physical properties.

PROGRESS —

Our participation in the Die Casting Research Foundation is our way of contributing to the future development of the die casting process and its usefulness as a metal working method.

For quality, service and cost, the above symbols are your guide to the best in die casting in the Midwest.

BADGER Die Casting Corp.

201 W. Oklahoma Avenue Milwaukee 7, Wisconsin

Circle No. 82 on Reader Service Card

DIE CASTING "ID" IMPROVEMENT & DEVELOPMENT CORP.

DIE PRESERVATIVE NO. 101

$101 combines excellent rust protection and ease of application by evaporation to provide a material ideally suited for the die casting industry.

$101 penetrates deep sections and moving parts of the die to replace lubrication loss from caustic cleaners, thus eliminating the necessity of "stripping-down" to grease ejection and slides.

Should prolonged overheating of the die occur, prior to casting, $101 will liquefy and evaporate leaving a minimum of stain in the cavity.

Available in the handy spray can, $101 may also be purchased in 5, 15, 30 or 55 gallon quantities for use in refillable spray containers or for dip tank application.

For complete information write to:

The DIE CASTING "ID" CORP.
4902 LEDGE AVE. NORTH HOLLYWOOD, CALIF.

Circle No. 21 on Reader Service Card

NOMINATIONS NOW OPEN FOR DIE CASTING AWARD

Nominations are now open for the 1960 Doehler Award which recognizes outstanding contributions to the advancement of the die casting art. The Award, consisting of a plaque and cash honorarium of at least $500.00, is made annually by the American Die Casting Institute, national association of custom die casters.

Three considerations govern the Award Committee in the selection of the recipient of the Doehler Award: (1) technical achievement — as measured by significant scientific contributions of a metallurgical or engineering nature relating to the die casting process; (2) advancements in plant operations — of a management or administrative nature and related to the operational phases of the industry; (3) other activities — not primarily of a scientific or operational nature that result in the enhancement of the reputation and acceptability of die castings. To be eligible for consideration an achievement in any of the above classes must be generally applicable to the industry.

Nominations for the Doehler Award, along with supporting papers or other related material, should be submitted before April 15, 1960 to: Award Committee, American Die Casting Institute, 366 Madison Avenue, New York 17, New York.

BERYLLIUM CORP. NAMES DENNY TO TECHNICAL STAFF

Dr. John P. Denny has joined the technical division of The Beryllium Corporation, Reading, Pa., as project supervisor, physical metallurgy. He is responsible for the physical metallurgical activities for beryllium metal development.

He was formerly specialist in physical metallurgy with the General Engineering Laboratories of the General Electric Company. Before joining General Electric in 1950, he was a Research Fellow at the University of Utah and had been a research engineer at the Battelle Memorial Institute.

KAISER ALUMINUM APPOINTMENTS

Two key appointments in the Industrial Division of KAISER ALUMINUM & CHEMICAL CORP. are announced by S. B. White, vice president and general manager of the division.

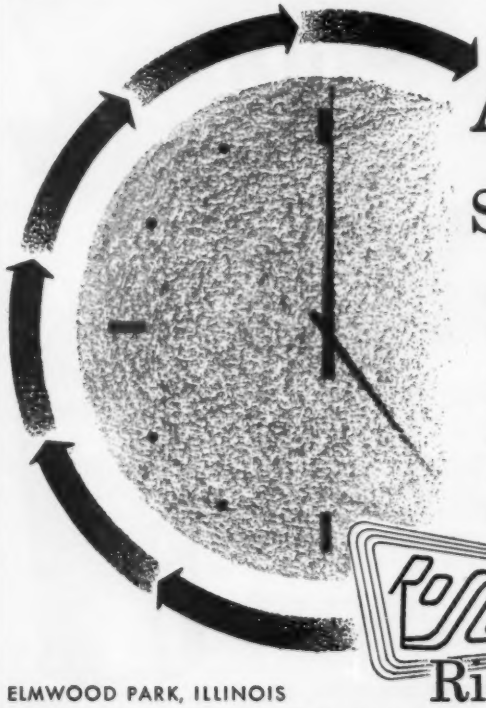
William J. Edmunds, Jr. has been appointed manager of sheet and plate, and Robert F. Tighe has been named manager of extrusions and forgings.

FARADYNE ELECTRONICS BUYS CASTING FIRM

The Faradyne Electronics Corp. has acquired the Investment Casting Co., Springfield, N.J. The casting company is a producer of both ferrous and non-ferrous investment castings. Faradyne plans to expand the casting facilities to give improved quality and service.

MANGANESE PRODUCTION PLANT ON STREAM

Foote Mineral Co. has reported that the expansion of its electrolytic manganese facilities in Knoxville, Tenn. has been completed. The new plant is now producing and has increased the capacity of the Loraine plant by 30%.



Around the Clock

Service and Production

When your production department is yelling at you to get those castings out "yesterday", you'll get the fastest service on your dies by coming to R. O. Schulz. We're set up for speed. We have the machines to make your dies, whether they're 15 tons or a few pounds, and the skilled designers and die makers to make them right. You get top quality workmanship at lowest cost when you take advantage of our specialized die and mold making facilities.

ELMWOOD PARK, ILLINOIS

Richard O. Schulz Company

DIE CASTING DIES • PLASTIC INJECTION AND COMPRESSION DIES

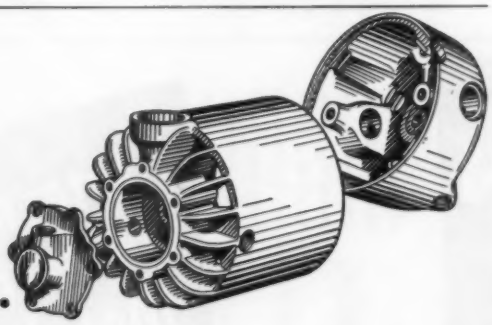
Circle No. 46 on Reader Service Card

DATA OFFERED IN THIS MONTH'S ADS

Qualified readers may obtain any of these free reference materials by circling the numbers on the Reader Service Cards

1. **Investment Castings** — Vascoloy-Ramet Co.—Booklet—"Solve Your Small Parts Problems" shows the design flexibility of the investment casting process.
2. **Die Casting Machines** — ABC Die Casting Machine Co.—12-page catalog—gives specifications on air and hydraulically operated die casting machines from 16 tons to 600 tons.
3. **Die Lubricant** — Acheson Colloids Co. — Technical bulletins — on colloidal graphite water base lubricants for use in dies and other abrasive high temperature and pressure applications.
5. **Tool Steels** — Allegheny Ludlum Steel Corp. — Technical literature — list describes 125 technical publications on tool steels.
10. **Piston Ring** — Auto-Diesel Piston Ring Co. — Catalog — lists plunger rings, tips, liners and combination tip-rings.
11. **Compacting Press** — Industrial Equipment Div., B-L-H Corp. — Complete details — on the Model 50 W low cost compacting press.
16. **Die Casting** — Cleveland Automatic Machine Co.—Technical data—on a machine that has 650-tons locking pressure and will handle a shot of 10.6 lbs. aluminum or 25.8 lbs. zinc.
20. **Standard Unit Dies** — Detroit Mold Engineering Co.—Production information — tells how to make die changes in minutes.
24. **Lubricating Oil** — Fiske Brothers Refining Co.—Information—on darl base lubricating oil for drawing, stamping and machining.
25. **Die Castings** — Gries Reproducer Corp. — Technical bulletins — on small zinc alloy die castings and molded plastic parts.
27. **Die Casting** — Hampden Brass & Aluminum — Facilities brochure — shows how they can handle your die casting requirements.
28. **Zinc Die Casting** — Henning Bros. & Smith, Inc.—Engineering data—Die Casting with Zinc Alloys.
29. **Investment Casting** — Hitchiner Mfg. Co. — 13-page booklet — explains the ceramic shell investment casting process and shows Hitchiner's facilities.
31. **Die Casting** — Hydraulic Press Mfg. Co.—Specifications—and other information on the Cast-Master line of die casting machines.
33. **Die Casting Machines** — Kux Machine Co.—Catalog—gives complete specifications on a line of 28 new die casting machines.

It takes "More Than a Machine" to Produce GOOD Die Castings...



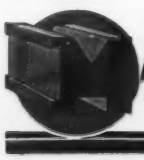
and MILWAUKEE has what it takes!

Among other needed factors, it takes a staff of trained die casting engineers . . . skilled die designers . . . die builders . . . machine operators . . . plus an intimate knowledge of the die casting process, its limitations and possibilities. Most important, it takes the kind of *know how* acquired only through years of specialization in the design and production of die castings in many shapes and sizes for thousands of different applications.

A pioneer of the die casting industry, Milwaukee offers everything you need for the production of fine die castings . . . completely modern plant facilities . . . highly skilled technicians . . . and more than 50 years of continuous service to die casting users throughout industry.

Milwaukee operates under the Certified Zinc Plan of the American Die Casting Institute.

Milwaukee has a separate plant for the production of Lead and Tin Die Castings.



MILWAUKEE DIE CASTING COMPANY
4146 N. HOLTON STREET • MILWAUKEE 12, WISCONSIN
Established 1909

A 7237-⅓

Circle No. 37 on Reader Service Card

THE PIERCE-WALLER AIR-LUBE SYSTEM

CUTS COSTS for DIE-CASTERS

- CLEANS
- LUBRICATES

Remove loose flash and clean the mold with a powerful, clean air blast — then lubricate all mold surfaces evenly, *using the same gun* —with a flick of the thumb! Adjustment *at the gun* for full range from zero to a heavy mist, spraying, fogging, or vaporizing the lubricant. Speeds up mold operation and reduces casting rejects. Makes every machine cycle count.

USED IN LARGE AND SMALL SHOPS EVERYWHERE!

WRITE FOR FREE FOLDER

PIERCE-WALLER, INC.
P. O. Box 2121A • DAYTON 29, OHIO

Circle No. 76 on Reader Service Card

35. **Die Castings** — Litemetal Dicast Inc. — Design information — on all types of die castings.

41. **Sintering Furnace** — Kinney Div., New York Air Brake Co.—Technical bulletin — on a high vacuum sintering furnace for laboratory and production use.

42. **Die Casting** — Paramount Die Casting Co.—Technical manual—"Designing for Die Casting".

43. **Trim Presses** — Hannifin Co.—Technical literature—gives specifications and advantages on open gap or column type trimming presses.

45. **Sintering** — Reese Metal Products Corp.—Technical report—"How to Cut Costs With The Remet Powdered Metals Process."

47. **Ladles & Skimmers** — Spincraft, Inc.—Technical data—and prices on stainless steel ladles and skimmers.

48. **Automatic Casting Machine** — Stahl Specialty Co.—Technical bulletin—describes the Stahl Autocast automatic machine for permanent mold casting in aluminum alloy.

50. **Temperature Control** — West Instrument Co.—Technical Bulletins — JSB and JB give the facts on time-temperature controllers.

51. **Chromate Coatings** — Allied Research Products, Inc.—Technical booklet—on the Iridite line of chromate conversion coatings for non-ferrous metals.

52. **Barrel Finishing** — Electro Minerals Div. of the Carborundum Co.—Technical booklet — on the Carboltrol 7 Process.

53. **Chemical Finishing** — Heatbath Corp.—Technical data—on chemicals for polishing, deburring and protecting die castings.

54. **Electrocleaner** — Oakite Products, Inc. — Technical information — tells how Oakite 190 removes smut, scale, rust and oil films.

55. **Automatic painting** — Ransburg Electro-Coating Corp.—Process brochure—shows examples of production painting for plants.

69. **Die Casting Machines** — Lester-Phoenix, Inc. — Specifications — on the complete line of Lester die casting machines for aluminum or zinc.

70. **Sintering** — New Jersey Zinc. Co.—Technical booklet—"Designing for Pressed Brass and Nickel Silver Metal Powder Parts."

73. **Fire-Resistant Hydraulic Fluids** — Union Carbide Chemicals Co.—Technical Report—on laboratory tests, "Ucon Hydrolubes Spell Safety", includes service records.

75. **Flat Finishers** — Hammond Machinery Builders—Technical literature — on machines for grinding, polishing and deburring.

76. **Mold Lubrication** — Pierce-Waller Inc.—Data sheets—available on the Air-Lube System for cleaning and lubricating mold surfaces.

77. **Die Steel** — Universal-Cyclops Steel Corp. — Technical data — on vacuum degassed Thermold AV die casting die steel.

78. **Crucibles** — Denver Fire Clay Co.—Catalog—gives full information on a line of crucibles and funnels for the casting industry.

80. **Compacting Press** — International Sales Management Co.—Specifications and data—on the Fawcett 3000 ton Special Purpose Hydraulic Metal Powder Compacting Press.

83. **Metal Prep** — Neilson Chemical Co. — Technical literature — on the Prep Products line of conditioners and strippers for ferrous and non-ferrous metals.

86. **Sintering** — Foote Mineral Co. — Metallurgical information—on new techniques for solid state alloying of nickel or cobalt.

87. **Spotting Press** — Palfy Die & Mold Co. — 4-page technical brochure — gives complete specifications on the Bradwell mold spotting press.

88. **Sintering** — Republic Steel — Technical data—on HS6460 metal powder for high strength sinterings.

90. **Barrel Finishing** — Almco, Queen Products Div., King-Seeley Corp.—52-page engineering manual — on barrel finishing, includes case histories.

91. **Metallurgy** — Metal Control Laboratories — Technical literature — on the solution of various metallurgical problems.

HUDSON BAY
SPECIAL HIGH GRADE ZINC — 99.99%
International Minerals and Metals Corp.
11 Broadway
New York 4, N.Y.
One Fine Zinc For Die Casting

Circle No. 32 on Reader Service Card

PMM

READER SERVICE CARD...

To receive any of the free literature listed in this issue tear out a reader service card and circle the proper numbers.

BE SURE YOUR NAME, ADDRESS, COMPANY NAME, & JOB TITLE ARE LEGIBLE.

FIRST CLASS
PERMIT No. 8066
CLEVELAND, OHIO

BUSINESS REPLY MAIL
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

POSTAGE WILL BE PAID BY: *Reader Service Department*

Precision Metal Molding
812 Huron Road
Cleveland 15, Ohio

FIRST CLASS
PERMIT No. 8066
CLEVELAND, OHIO

BUSINESS REPLY MAIL
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

POSTAGE WILL BE PAID BY: *Reader Service Department*

Precision Metal Molding
812 Huron Road
Cleveland 15, Ohio

FIRST CLASS
PERMIT No. 8066
CLEVELAND, OHIO

BUSINESS REPLY MAIL
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

POSTAGE WILL BE PAID BY: *Reader Service Department*

Precision Metal Molding
812 Huron Road
Cleveland 15, Ohio

FIRST CLASS
PERMIT No. 8066
CLEVELAND, OHIO

BUSINESS REPLY MAIL
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

POSTAGE WILL BE PAID BY: *Reader Service Department*

Precision Metal Molding
812 Huron Road
Cleveland 15, Ohio

READER SERVICE CARD...

PMM

To receive any of the free literature listed in this issue tear out a reader service card and circle the proper numbers.

BE SURE YOUR NAME, ADDRESS, COMPANY NAME, & JOB TITLE ARE LEGIBLE.

PLEASE PRINT — MARCH 1960, DO NOT USE AFTER 6-15-60

Name ..... Position .....

Company ..... Kind of Business .....

Street .....

City ..... Zone ..... State .....

Please send me additional information and literature on items circled below.

1	19	37	55	73	91	109	127	145	163	181	199	217	235	253	271	289	307	325	343	361	379	397
2	20	38	56	74	92	110	128	146	164	182	200	218	236	254	272	290	308	326	344	362	380	398
3	21	39	57	75	93	111	129	147	165	183	201	219	237	255	273	291	309	327	345	363	381	399
4	22	40	58	76	94	112	130	148	166	184	202	220	238	256	274	292	310	328	346	364	382	400
5	23	41	59	77	95	113	131	149	167	185	203	221	239	257	275	293	311	329	347	365	383	401
6	24	42	60	78	96	114	132	150	168	186	204	222	240	258	276	294	312	330	348	366	384	402
7	25	43	61	79	97	115	133	151	169	187	205	223	241	259	277	295	313	331	349	367	385	403
8	26	44	62	80	98	116	134	152	170	188	206	224	242	260	278	296	314	332	350	368	386	404
9	27	45	63	81	99	117	135	153	171	189	207	225	243	261	279	297	315	333	351	369	387	405
10	28	46	64	82	100	118	136	154	172	190	208	226	244	262	280	298	316	334	352	370	388	406
11	29	47	65	83	101	119	137	155	173	191	209	227	245	263	281	299	317	335	353	371	389	407
12	30	48	66	84	102	120	138	156	174	192	210	228	246	264	282	300	318	336	354	372	390	408
13	31	49	67	85	103	121	139	157	175	193	211	229	247	265	283	301	319	337	355	373	391	409
14	32	50	68	86	104	122	140	158	176	194	212	230	248	266	284	302	320	338	356	374	392	410
15	33	51	69	87	105	123	141	159	177	195	213	231	249	267	285	303	321	339	357	375	393	411
16	34	52	70	88	106	124	142	160	178	196	214	232	250	268	286	304	322	340	358	376	394	412
17	35	53	71	89	107	125	143	161	179	197	215	233	251	269	287	305	323	341	359	377	395	413
18	36	54	72	90	108	126	144	162	180	198	216	234	252	270	288	306	324	342	360	378	396	414

PLEASE PRINT — MARCH 1960, DO NOT USE AFTER 6-15-60

Name ..... Position .....

Company ..... Kind of Business .....

Street .....

City ..... Zone ..... State .....

Please send me additional information and literature on items circled below.

1	19	37	55	73	91	109	127	145	163	181	199	217	235	253	271	289	307	325	343	361	379	397
2	20	38	56	74	92	110	128	146	164	182	200	218	236	254	272	290	308	326	344	362	380	398
3	21	39	57	75	93	111	129	147	165	183	201	219	237	255	273	291	309	327	345	363	381	399
4	22	40	58	76	94	112	130	148	166	184	202	220	238	256	274	292	310	328	346	364	382	400
5	23	41	59	77	95	113	131	149	167	185	203	221	239	257	275	293	311	329	347	365	383	401
6	24	42	60	78	96	114	132	150	168	186	204	222	240	258	276	294	312	330	348	366	384	402
7	25	43	61	79	97	115	133	151	169	187	205	223	241	259	277	295	313	331	349	367	385	403
8	26	44	62	80	98	116	134	152	170	188	206	224	242	260	278	296	314	332	350	368	386	404
9	27	45	63	81	99	117	135	153	171	189	207	225	243	261	279	297	315	333	351	369	387	405
10	28	46	64	82	100	118	136	154	172	190	208	226	244	262	280	298	316	334	352	370	388	406
11	29	47	65	83	101	119	137	155	173	191	209	227	245	263	281	299	317	335	353	371	389	407
12	30	48	66	84	102	120	138	156	174	192	210	228	246	264	282	300	318	336	354	372	390	408
13	31	49	67	85	103	121	139	157	175	193	211	229	247	265	283	301	319	337	355	373	391	409
14	32	50	68	86	104	122	140	158	176	194	212	230	248	266	284	302	320	338	356	374	392	410
15	33	51	69	87	105	123	141	159	177	195	213	231	249	267	285	303	321	339	357	375	393	411
16	34	52	70	88	106	124	142	160	178	196	214	232	250	268	286	304	322	340	358	376	394	412
17	35	53	71	89	107	125	143	161	179	197	215	233	251	269	287	305	323	341	359	377	395	413
18	36	54	72	90	108	126	144	162	180	198	216	234	252	270	288	306	324	342	360	378	396	414

PLEASE PRINT — MARCH 1960, DO NOT USE AFTER 6-15-60

Name ..... Position .....

Company ..... Kind of Business .....

Street .....

City ..... Zone ..... State .....

Please send me additional information and literature on items circled below.

1	19	37	55	73	91	109	127	145	163	181	199	217	235	253	271	289	307	325	343	361	379	397
2	20	38	56	74	92	110	128	146	164	182	200	218	236	254	272	290	308	326	344	362	380	398
3	21	39	57	75	93	111	129	147	165	183	201	219	237	255	273	291	309	327	345	363	381	399
4	22	40	58	76	94	112	130	148	166	184	202	220	238	256	274	292	310	328	346	364	382	400
5	23	41	59	77	95	113	131	149	167	185	203	221	239	257	275	293	311	329	347	365	383	401
6	24	42	60	78	96	114	132	150	168	186	204	222	240	258	276	294	312	330	348	366	384	402
7	25	43	61	79	97	115	133	151	169	187	205	223	241	259	277	295	313	331	349	367	385	403
8	26	44	62	80	98	116	134	152	170	188	206	224	242	260	278	296	314	332	350	368	386	404
9	27	45	63	81	99	117	135	153	171	189	207	225	243	261	279	297	315	333	351	369	387	405
10	28	46	64	82	100	118	136	154	172	190	208	226	244	262	280	298	316	334	352	370	388	406
11	29	47	65	83	101	119	137	155	173	191	209	227	245	263	281	299	317	335	353	371	389	407
12	30	48	66	84	102	120	138	156	174	192	210	228	246	264	282	300	318	336	354	372	390	408
13	31	49	67	85	103	121	139	157	175	193	211	229	247	265	283	301	319	337	355	373	391	409
14	32	50	68	86	104	122	140	158	176	194	212	230	248	266	284	302	320	338	356	374	392	410
15	33	51	69	87	105	123	141	159	177	195	213	231	249	267	285	303	321	339	357	375	393	411
16	34	52	70	88	106	124	142	160	178	196	214	232	250	268	286	304	322	340	358	376	394	412
17	35	53	71	89	107	125	143	161	179	197	215	233	251	269	287	305	323	341	359	377	395	413
18	36	54	72	90	108	126	144	162	180	198	216	234	252	270	288	306	324	342	360	378	396	414

THE FOLLOWING WOULD LIKE TO GET PMM EACH MONTH:

DO NOT WRITE IN THESE SPACES

P 1	
JOB	
SIC	
P 2	
P 3	
PER	

Name _____ Position _____

Name _____ Position _____

Company _____

Address _____

Major Products made at this address: _____

THIS PLANT (USES) (PRODUCES) ☐ TYPES OF PARTS CHECKED BELOW:

- ☐ Die Castings
- ☐ Extrusions
- ☐ Investment Castings
- ☐ Powder Metal Parts
- ☐ Permanent Mold Castings
- ☐ Plaster Mold Castings
- ☐ Shell Mold Castings
- ☐ None of these

If it's speed you're after...

call a Hoover Man

Hoover's not directly involved with space travel. But we're a down-to-earth company serving many topflight industries. We produce quality castings, and have been doing it for 36 years. Whatever you want in aluminum or zinc alloy castings, you can count on Hoover for speedy service. We'd like to prove it to you. Call one of our Sales Engineers . . . he'll give you the whole story.

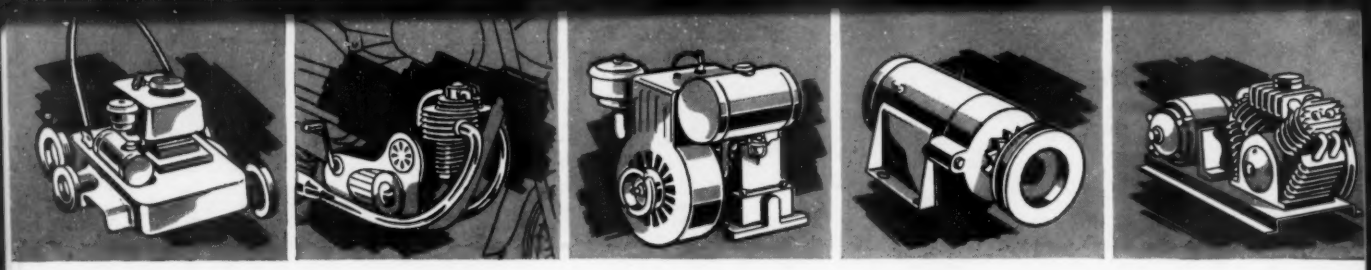
HOOVER

THE HOOVER COMPANY, Die Casting Division, North Canton, Ohio
In Canada — Hamilton, Ontario

Die Casting specialists since 1922

DIE CASTING *by* HOOVER

Circle No. 30 on Reader Service Card



LIGHT, DURABLE ALUMINUM HELPS BUILD MODERN MOTORS

Whether you're mowing the lawn or motor boating, enjoying air conditioning or running a power saw, you are relying on motors—and *aluminum*. The power and efficiency of these mighty units help you perform many tasks better and faster, at considerable saving of energy.

The growing motor-building industry serves you and itself exceedingly well—through aluminum. Lightweight aluminum gives extra ease of handling to motor-equipped appliances, and its ability to resist rust, corrosion, pitting and chipping assures longer, trouble-free life. Aluminum contributes strength wherever it is used, reduces costs as it saves steps in the production process.

Apex Smelting works hand in hand with the builders of modern motors. Apex aluminum alloys, scientifically produced to each manufacturer's exacting requirements, are significant factors in the outstanding performance and quality you enjoy in today's motors.

Warehouse distributor of ALCAN foundry alloy ingot

APEX SMELTING COMPANY

Producers of ALUMINUM, MAGNESIUM AND ZINC ALLOYS

CHICAGO 12 CLEVELAND 5 LONG BEACH 10, CAL.

SPRINGFIELD, OREGON (National Metallurgical Corp.)

Circle No. 9 on Reader Service Card

Research leadership back of every ingot

Your products may also be produced better and more efficiently with the help of aluminum castings. Apex Smelting and the companies it serves in the die casting and foundry industry stand ready to assist you and your engineers.